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State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
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GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

February 8, 2024

Ms. Eileen White, Executive Officer
Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1500
Oakland, CA 94612
Eileen.White@waterboards.ca.gov

Subject**:** 2023 Annual Self-Monitoring Report, Final Order Number: R2-2018-0020; (rescinded R2-2012-0014), Eden Landing Ecological Reserve (Baumberg Complex), Alameda County

Dear Ms. White:

The California Department of Fish and Wildlife (CDFW) is submitting the 2023 Self-Monitoring Report (SMR) in compliance with the Waste Discharge Requirements described in the subject Final Order for the South Bay Salt Pond Restoration Project (SBSPRP) at Eden Landing Ecological Reserve. The 2023 SMR includes revised Operations Plans for 2024 (attachment). We have provided the electronic data files for pond monitoring to your staff directly for analysis and interpretation. The U.S. Fish and Wildlife Service (USFWS) submits a separate report covering the Alviso and Ravenswood Complexes in Santa Clara and San Mateo Counties, respectively.

We appreciate your staff's continued support associated with CDFW's operation and management of the ponds as part of the SBSPRP. The 2017 revised reporting requirements for the Final Order and SMR were continued in 2023. If you have any questions, please contact Mr. John Krause, Senior Environmental Scientist (Supervisory), at John.Krause@wildlife.ca.gov.

Sincerely,

DocuSigned by:
Erin Chappell
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Erin Chappell
Regional Manager
Bay Delta Region

Attachments

ec: See Next Page

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2023 Self-Monitoring Report
Baumberg Complex – Hayward, California
Eden Landing Ecological Reserve

Order Number: R2-2018-0020
(rescinded R2-2012-0014)

Prepared for:

California Regional Water Quality Control Board
San Francisco Bay Region
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Prepared by:

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January 2024

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Introduction

This annual self-monitoring report (SMR) for the Regional Water Quality Control Board (RWQCB) Final Order R2-2012-0014, rescinded by R2-2018-0020, (Final Order) summarizes the pond operations, management and monitoring conducted by the California Department of Fish and Wildlife (CDFW) from May to October 2023 at the Eden Landing Ecological Reserve (ELER) in Hayward, California. For this 2023 SMR, CDFW followed the revised 2017 format which removed outdated information required by the previous authorization (Final Order R2-2008-0078). We maintained SMR revisions in compliance with the current Final Order.

Monitoring is conducted for pond operations as required by the RWQCB Final Order. The Final Order for the South San Francisco Bay Low Salinity Salt Ponds covered 15,100 acres of ponds in Alameda, Santa Clara, and San Mateo counties. Phase One of the South Bay Salt Ponds Restoration Project (SBSPRP) was completed in 2016. Data for pond management was collected according to the Self-Monitoring Program outlined in the Final Order. The initial “B” for the Baumberg Complex ponds has been changed to “E” for Eden Landing, in accordance with the nomenclature used for the SBSPRP. The U.S. Fish and Wildlife Service (USFWS) separately submit reports for the Alviso and Ravenswood Complexes.

ELER pond systems operated by CDFW in 2023 are described in the attached Operations Plans, updated for 2023. Current management in ponds E10/E11 and E12/E13 and E14 (managed ponds, reconfigured and enhanced managed ponds), and modified pond operations in System E6A (Ponds E8, E6B, and E6A) for multi-season/species operations.

CDFW staff collected pond operations data in accordance with the Final Order requirements. Water quality monitoring was performed in 2023 using pond grab samples; continuous monitoring devices are not required for Dissolved Oxygen, pH, temperature, and salinity. Receiving water monitoring was not conducted. Observed water levels and salinity from grab samples had values within ranges specified in the Operations Plans and Final Order Water Quality Objectives (WQOs) and adequately protected receiving waters. Pond operations and management activities were conducted to meet objectives described in the Final Order and CDFW’s Operations Plans for each system.

The ponds are generally being operated as “muted tidal” systems with intake and discharge at the same location, with continuous circulation. Pond operations are fully described in the updated 2023 Operations Plans. Water enters ponds directly from San Francisco Bay (Bay) or sloughs on high tides via Water Control Structures (WCSs), with flow to one or more ponds, then discharges at low tide. The ponds discharge at tide stages lower than pond water elevations, typically averaging 3.5-feet (NGVD). Discharge is presumed to occur for approximately 13 to 16 hours per day (based on predicted tides and spring or neap tide cycle variation). Pond intake is presumed to occur at elevations of approximately 1.5 feet or more above pond water levels due to required head (pressure)for in-flow based on data and observations from previous years.

The Final Order established maximum salinity levels below 44 parts per thousand (ppt) for discharge from the ponds. In 2021, operation of all systems was monitored and discharge was below 44ppt, with exceptions noted. Other water quality parameters were not regularly sampled. Ponds were not significantly affected by major construction actions and were operated as open water or seasonal

(dry) habitat. No adverse conditions such as fish kills were observed in ponds or receiving waters. Water quality monitoring activities were conducted as described in subsequent sections of this report.

This SMR includes summary information of pond operations and management. Pond operations were similar to previous years.

Low dissolved oxygen (DO) levels at the point of discharge have previously been previously observed to fall below a 10^{th} percentile value of 3.3 mg/L (calculated on a calendar weekly basis). Low DO conditions may be expected during extended periods of high air and water temperature and appear to represent natural DO variations in sloughs or lagoon systems. It has been documented that DO levels below the Basin Plan standard of 5.0mg/L are observed in sloughs not affected by any pond discharge and are within the natural range of variation of the South San Francisco Bay. A summary of grab sample data and discharge events are included in this report in Table 1. Full data sets are provided to RWQCB staff electronically. Additional analysis and interpretation of monitoring data is not expected to be completed nor submitted for 2023.

2023 Annual Summary

For All Pond Systems:

Grab samples were collected at pond-to-pond, intake and/or discharge locations to monitor pond conditions and meet habitat management and water quality objectives. Salinity, water level and circulation patterns such as flow direction at a culvert location, as well as bird guild/species and abundance were monitored throughout the pond systems. We observed conditions which indicated good water quality, based on observed waterbird use, primarily correlated with salinity and water depth. During summer operations, water levels in the ponds are maintained throughout the season primarily by adjusting discharge gates, rather than intake gates, with consideration of neap tide cycles, weather conditions, habitat objectives and species use.

In 2023, pond management for continuous circulation was typical for summer operations. A summary of discharge events is shown on Table 1.

System E2C:

Pond E2C was operated in 2023 as described in the Operations Plan, similar to previous years. A continuous monitoring device for water quality was not utilized or required. Monitoring included grab samples collected on an approximately weekly basis for salinity and for water levels recorded from staff gauges installed in ponds at a WCS. Waterbird use was recorded to inform operations and meet habitat objectives. In 2023, 7 Western Snowy Plover (WSP) nests were monitored in pond E4C. Discharge was at or below 25% of capacity; therefore, no receiving water monitoring was required, as noted in the Final Order. System E2C operations were normal and regular flow occurs between E2C and Cargill Pond 3C and periodically between E2C and E5C.

System E2:

Pond E2 was operated in 2023 as described in the Operations Plan, similar to previous years. Discharge directly to the Bay from Pond E2 was generally maintained at 25% of capacity of one to

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two, 48-inch gates for much of the summer. A continuous monitoring device was not utilized or required. Monitoring included grab samples collected on an approximately weekly basis to monitor salinity, and water levels recorded from staff gauges. Waterbird use was recorded to inform operations and meet habitat objectives. There is limited flow from E1 to E7 to E6, and to E5 from E4 to maintain water in the eastern ponds. Managed “batch” ponds (E6, E5) allow salinity to increase to approximately 120-parts per thousand (ppt), maintaining water levels by providing “makeup” water (lost to evaporation) from adjacent ponds (E7 or E4). Batch ponds are recirculated in winter to maintain low salinity in the spring and summer monitoring season. E6C was managed as a seasonal pond and allowed to mostly dry. System E2 discharge operations during the winter successfully recirculated higher salinity conditions in “batch” and seasonal ponds (E5, E6, and E6C). Beneficial reuse material (BRM) was imported and placed on top of existing levees in ponds E4, E5, E6 and E7, and stored at the stockpile area near Veasy street. Linked System E2C also had BRM import and placement on top of the E6C levee.

System E10:

The E10 intake/discharge WCS and a pond-to-pond WCS (E10 to E11) replaced in 2017 continue to function as designed. The E10 WCS has a 48-inch culvert and combination gates on each side. The WCS between E10 and E11 has a 36-inch culvert and combination gates on each side. The E11 WCS on Mt. Eden Creek (MEC) was repaired in May, 2020 and has a 48” culvert with combination gates on both sides. This WCS previously had a box weir on the Pond E11 side. Typical operations were conducted in 2023 in System E10 ponds. Pond E10 is operated as a continuous circulation, low salinity pond, and pond E11 is operated as a seasonal pond with open water in summer drawing down in the fall to partly dry conditions. Pond E10 has intake from and discharge into the Bay at the mouth of MEC. E11 has periodic flow from Pond E10 in summer. Continuous monitoring devices (Datasondes) were not used in ponds or receiving waters.

System E6A:

In 2023, operations were conducted similar to previous years in System E6A ponds (E8, E6B, E6A). In summer, System E6A management targeted western snowy plover (WSP) nesting. In the winter, System 6A was managed with deeper water levels to provide foraging and roosting habitat for diving ducks. Continuous circulation intake/discharge operations were conducted, whereby low salinity conditions were maintained throughout the year in most of the borrow ditch and ponded areas throughout the system. Pond operations successfully provided target conditions for multi-season, multi-species management, including WSP and California Least Tern (CLT) nesting (37 WSP nests and 30 CLT nests monitored in 2023), and maintained low salinity conditions in the ponds subsequently benefiting overwintering waterfowl and migratory shorebirds.

System E9:

Ponds E9, E8A and E8X in System E9 were restored to full tidal action in 2011 as part of Phase One of the SBSPRP. Managed ponds E12, E13, and E14 previously linked to E9 and E8X are in System E12, below.

System E12:

Reconfigured ponds E12 and E13 were operated in 2023 and managed routinely as designed. Ponds E12 and E13 were reconfigured as a “salinity experiment” providing a series of shallow, open water cells of progressively increasing salinity with similar water levels. Significant use of the cells by small and medium shore birds is regularly observed as part of on-going monitoring and surveys. California Least Tern (CLT) nested in pond E14 for 3 years, 2017-2019; however, there was little successful breeding in 2020 and 2021 because the earliest nests were depredated and subsequent nesting attempts were apparently not attempted. In 2022 CLT successfully nested in E14 and an estimated 4-8 fledglings were produced. In 2023, 47 CLT nests were monitored in system E12. Western Snowy Plover (WSP) continue to use System E12 ponds, including dry bottom areas of E14, and dry berms, levees and islands in the reconfigured Ponds E12 and E13. In 2023, 48 WSP nests were monitored at in the E12 system. Pond E14 alone had 39 nests, which comprised of 36% of all nests in the South Bay. Pond operations in E12, E13 and E14 mostly maintained low salinity discharge (<44 ppt), though we prioritize management of threatened and endangered species over water quality as needed. Moderate to high salinity conditions (80 to 120 ppt) targeted within respective cells were observed in summer.

In 2023, intake/discharge operations and monitoring were conducted in System E12 ponds. Pond E8X was operated as a forebay for intake and discharge operations in pond E14. Ponds E14 and E8X were generally operated as shallow, muted tidal basins and periodically allowed pond-to-pond flow during brief periods from Pond E12 to meet water quality objectives for continuous circulation. Pond E14 was operated similarly to other seasonal ponds in ELER, with limited intake from tidal areas as needed under continuous circulation to support sufficient dry areas for WSP nesting and foraging. Ponds E12 and E13 discharged primarily to Mt. Eden Creek via the “mixing basin” area within E13. Periodically, E14 received low-volume flow from E13 to maintain more constant water surface elevations in E14.This system provided good habitat conditions for shorebirds, particularly WSP and CLT, as well as waterfowl throughout 2023.

Table 1: Summary of Intake/Discharge Activities

Complete data and field notes for pond operations/conditions and management activities provided electronically to RWQCB and are otherwise available upon request.

NOTE: Table 1 salinity values obtained from a hand-held refractometer (Parts Per Thousand, or ppt). In previous reports, Baumberg “B” aka Eden Landing “E”. Staff gauge readings are specific to each pond (or pond system), and vary between NGVD 29, NAVD 88 or relative to pond bottom.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
2C	E2C-14	5/4/2023	20	below	staff ~3'. 2x48" intake at 2x100%; 2X48" discharge at 1X25%, 1X5%. Tide low, flood, neap; rain.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
2C	E2C-14	5/18/2023	25	below	staff ~3.2'. 2x48" intake at 2x100%; 2X48" discharge at 1X25%, 1X5%. **Reduced intake to 1x50%, 1x100%.** Tide low, ebb, neap->spring tides.
2C	E2C-14	5/22/2023	25	below	staff ~3.2'. 2x48" intake at 1x100%, 1x50%; 2X48" discharge at 1X25%, 1X5%. **Increased intake to 2x100%.** Tide low, ebb, spring->neap tides.
2C	E2C-14	5/31/2023	28	below	staff ~3.2'. 2x48" intake at 2x100%; 2X48" discharge at 1X25%, 1X5%. **Increased discharge to 2x25%.** Tide high, ebb, neap->spring tides.
2C	E2C-14	6/8/2023	30	<3	2x48" intake at 2x100%; 2X48" discharge at 2X25%. **Reduced discharge to 1x25%, 1x5%** to increase WSE. Tide low, flood, spring tides.
2C	E2C-14	6/21/2023	34	<2	2x48" intake at 2x100%; 2X48" discharge at 1X25%, 1x5%. **Reduced discharge 1x15%, 1x5%**. Tide low, flood, spring->neap tides.
2C	E2C-14	7/3/2023	30	3.30	2x48" intake at 2x100%; 2X48" discharge at 1X15%, 1x5%. **Increased discharge to 2x25%, reduced intake to 2x50%**, spring tides cont. Tide Low, flood, spring tides.
2C	E2C-14	7/6/2023	35	<3	2x48" intake at 2x50%; 2X48" discharge at 2x25%. **Reduced discharge. to 1x5%, 1x25%**, **Increased intake 2x100%.** Tide low, flood, spring->neap tides.
2C	E2C-14	7/12/2023	34	<3	2x48" intake at 2x100%; 2X48" discharge at 1x5%, 1x25%. **Reduced discharge to 1x5%, 1x10%**, pond WSE low. Tide high, flood, spring tides.
2C	E2C-14	7/31/2023	31	3.40	2x48" intake at 2x100%; 2X48" discharge at 1x5%, 1x10%. **Increased discharge 2x25%, Red. intake 2x50%**. Tide high, flood, king tides cont.
2C	E2C-14	8/4/2023	34	<3	2x48" intake at 2x50%; 2X48" discharge at 2x25%. **Red. Disch. 1x5%, 1x15%, Increased intake 2x100%**. Tide low, ebb, end of king tides->neap tides.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
2C	E2C-14	8/17/2023	37	~3	2x48" intake at 2x100%; 2X48" discharge at 1x15%, 1x5%. **Reduced discharge 1x5%, 1x10%**. Tides low, ebb, spring->neap tides.
2C	E2C-14	8/24/2023	42	~3	2x48" intake at 2x100%; 2X48" discharge at 1x10%, 1x5%. **Increased discharge 1x5%, 1x25%**. Tide high, ebb, neap->spring tides.
2C	E2C-14	8/29/2023	33	3.40	2x48" intake at 2x100%; 1X48" discharge at 1x25%, 1x5%. **Increased discharge 2x25%** to maintain WSE. Tide high, ebb, spring tides cont.
2C	E2C-14	9/5/2023	44	below	2x48" intake at 2x100%; 2X48" discharge at 2x25%. **Reduced discharge 1x10%, 1x5%**, transition to fall ops, increase WSE shallow for migration. Tide low, ebb, spring tides.
2C	E2C-14	10/4/2023	40	3.55	2x48" intake at 2x100%; 2X48" discharge at 1x10%, 1x5%. **Reduced discharge to 2x5%**, fall ops. Tide low, ebb, spring->neap tides.
2C	E2C-14	10/11/2023	40	3.60	2x48" intake at 2x100%; 2X48" discharge at 2x5%. **Increased discharge to 1x5%, 1x20%**. Tide high, ebb, neap->spring tides.
2C	E2C-14	10/19/2023	51	<3	2x48" intake at 2x100%; 2X48" discharge at 1x5%, 1x20. **Reduced discharge to 2x5%,** transition to winter ops, increase WSE. Tide low, ebb, neap tides cont.
2C	E2C-14	10/26/2023	40	3.6	2x48" intake at 2x100%; 2X48" discharge at 2x5%, increase WSE for winter ops. Tide low, flood, neap->spring tides.
2	E2-10	5/11/2023	30	3.5	2x48" discharge at 1x25%, 1x0%; 2x48" intakes at 2x100%. **Increased discharge to 1x5%, 1x45%**, summer ops, reduce WSE. Tide low, ebb, neap->spring tides.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
2	E2-10	5/31/2023	34	3.10	2x48" discharge at 1x45%, 1x5%; 2x48" intakes at 2x100%. **Increased discharge to 1x20%, 1x45%**. Tide high, ebb, neap->spring tides.
2	E2-10	6/21/2023	34	3.10	2x48" discharge at 1x45%, 1x20%; 2x48" intakes at 2x100%. **Reduced discharge to 1x5%, 1x25%**, raise WSE to protect nesting islands. Tide low, flood, spring->neap tides.
2	E2-10	7/31/2023	25	3.3	2x48" discharge at 1x5%, 1x25%; 2x48" intakes at 2x100%. **Increased discharge to 1x5%, 1x50%.** Tide high, flood, king tides cont.
2	E2-10	9/5/2023	41	3.2	2x48" discharge at 1x5%, 1x50%; 2x48" intakes at 2x100%. **Reduced discharge to 1x5% 1x30%**. Tide low, ebb, spring->neap tides.
2	E2-10	10/4/2023	41	3.60	2x48" discharge at 1x5%, 1x30%; 2x48" intakes at 2x100%. **Reduced discharge to 1x5%, 1x15%**. Tide low, ebb, spring->neap tides.
2	E2-10	10/11/2023	40	3.50	2x48" discharge at 1x5%, 1x15%; 2x48" intakes at 2x100%. **Increased discharge to 1x5%, 1x25%**. Tide high, ebb, weak->spring tides.
10	E11-1	5/4/2023	22	5.65*	1X48" intake at 100%, 1x48" discharge at 15%. Tide low, flood, neap->spring tides; rain.
10	E11-1	5/15/2023	25	5.8*	1X48" intake at 100%, 1x48" discharge at 15%. Increased discharge to 25%. Tide high, flood, neap->spring tides.
10	E11-1	5/22/2023	25	5.7*	1X48" intake at 100%, 1x48" discharge at 25%. Reduced discharge to 15%. Tide low, ebb, spring->neap tides.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
10	E11-1	5/31/2023	30	5.5*	1X48" intake at 100%, 1x48" discharge at 15%. **Increased discharge to 25%.** Tide low, flood, neap->spring tides.
10	E11-1	6/8/2023	30	5.95*	1X48" intake at 100%, 1x48" discharge at 25%. **Increased discharge to 35%**. Tide low, ebb, spring tides cont.
10	E11-1	6/21/2023	30	5.3*	1X48" intake at 100%, 1x48" discharge at 35%. **Reduced discharge to 10%**, increase WSE. Tide low, ebb, spring->neap tides.
10	E11-1	7/6/2023	30	6.3*	1X48" intake at 100%, 1x48" discharge at 10%. **Increased discharge to 20%**, reduce WSE. Tide low, ebb, spring->neap tides.
10	E11-1	7/12/2023	34	5.60	1X48" intake at 100%, 1x48" discharge at 20%. **Reduced discharge to 10%**, incr. WSE. Tide high, flood, spring tides.
10	E11-1	7/31/2023	32	5.7*	1X48" intake at 100%, 1x48" discharge at 10%. **Increased discharge to 30%**. Tide low, flood, king tides cont.
10	E11-1	8/4/2023	34	5.7*	1X48" intake at 100%, 1x48" discharge at 30%. **Reduced discharge to 20%**, incr. WSE. Tide low, ebb, end of king tides.
10	E11-1	8/11/2023	32	5.7*	1X48" intake at 100%, 1x48" discharge at 20%. **Reduced discharge to 15%**, incr. WSE. Tide high, flood, spring tides cont.
10	E11-1	8/24/2023	36	5.8*	1X48" intake at 100%, 1x48" discharge at 15%. **Increased discharge to 20%**. Tide low, ebb, neap->spring tides.
10	E11-1	8/29/2023	36	5.7*	1X48" intake at 100%, 1x48" discharge at 20%. **Reduced discharge to 15%,** incr. WSE. Tide low, flood, spring tides cont.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
10	E11-1	9/5/2023	39	5.9*	1X48" intake at 100%, 1x48" discharge at 15%. **Reduced discharge to 10%**. Tide low, ebb, spring->neap tides.
10	E11-1	9/14/2023	39	6.1*	1X48" intake at 100%, 1x48" discharge at 10%. Leave discharge low to push flow through 11. Tide low, flood, neap tides cont.
10	E11-1	9/21/2023	48	6*	1X48" intake at 100%, 1x48" discharge at 10%. **Reduced discharge to 0% (CLOSED)** for salinity. Tide low, flood, neap tides cont.
10	E11-1	9/26/2023	43	6.2*	1X48" intake at 100%, 1x48" discharge at 0% **Opened discharge to 20%,** reduce WSE. Tide low, flood, neap->spring tides.
10	E11-1	10/4/2023	41	6.1*	1X48" intake at 100%, 1x48" discharge at 20%. **Reduced discharge to 10%**. Tide low, flood, spring->neap tides.
10	E11-1	10/11/2023	40	6.15*	1X48" intake at 100%, 1x48" discharge at 10%. **Increased discharge to 15%**. Tide low, ebb, neap->spring tides.
10	E11-1	10/19/2023	44	6.1*	1X48" intake at 100%, 1x48" discharge at 15%. **Reduced discharge to 10%** to maintain WSE. Tide low, flood, neap tides cont.
10	E11-1	10/26/2023	40	6.25*	1X48" intake at 100%, 1x48" discharge at 10%. **Increased discharge to 15%**. Tide high, flood, neap->spring tides.
11	E11-3	5/4/2023	26	below	1X48" intake at 40%, 1x48" discharge at 15%. Staff just under 0.5'. **Increased discharge to 25%, reduced intake to 25%**. Tide low, flood, neap->spring tides; rain.
11	E11-3	5/11/2023	30	below	1X48" intake at 25%, 1x48" discharge at 25%. Staff just under 0.5'. **Increased intake to 35%** to maintain WSE. Tide high, ebb, neap tides cont.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
11	E11-3	5/15/2023	25	below	1X48" intake at 35%, 1x48" discharge at 25%. Staff just under 0.5'. **Reduced intake to 15%, increased discharge to 40%**. Tide high, flood, neap->spring tides.
11	E11-3	5/22/2023	25	below	1X48" intake at 15%, 1x48" discharge at 40%. Staff well under 0.5'. **Increased intake to 45%, reduced discharge to 30%**. Tide low, ebb, spring->neap tides.
11	E11-3	5/31/2023	35	below	1X48" intake at 45%, 1x48" discharge at 30%. Staff well under 0.5'. **Reduced intake to 25%, Increased discharge to 50%**. Tide low, flood, neap->spring tides.
11	E11-3	6/8/2023	30	below	1X48" intake at 25%, 1x48" discharge at 50%. Staff well under 0.5'. **Reduced discharge to 30%**. Tide low, ebb, spring->neap tides.
11	E11-3	6/14/2023	30	below	1X48" intake at 25%, 1x48" discharge at 30%. Staff well under 0.5'. **Increased discharge to 50%**. Tide high, flood, neap->spring tides.
11	E11-3	6/21/2023	30	below	1X48" intake at 25%, 1x48" discharge at 50%. Staff well under 0.5'. **Reduced discharge to 20%, increased intake to 50%**. Tide low, ebb, spring->neap tides.
11	E11-3	7/18/2023	35	below	1X48" intake at 50%, 1x48" discharge at 50%. Staff well below 0.5'. **Reduced discharge to 25%, Increased intake to 75%**. Tide low, flood, spring->neap tides.
11	E11-3	7/31/2023	35	below	1X48" intake at 75%, 1x48" discharge at 25%. Staff well under 0.5'. **Increased discharge to 60%, reduced intake to 25%**, maintain low WSE to encourage flow from 10. Tide low, flood, king tides cont.
11	E11-3	8/4/2023	36	below	1X48" intake at 25%, 1x48" discharge at 60%. Staff just under 0.5'. **Reduced discharge to 20%**. Tide low, ebb, end of king->neap tides
11	E11-3	8/11/2023	35	below	1X48" intake at 25%, 1x48" discharge at 20%. Staff just under 0.5'. **Increased intake to 35%** to maintain WSE. Tide high, flood, spring tides cont.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
11	E11-3	8/24/2023	44	below	1X48" intake at 35%, 1x48" discharge at 20%. Staff just under 0.5'. **Increased discharge to 70%**, maintain WSE, allow intake to reduce salinity. Tide low, ebb, neap->spring tides.
11	E11-3	8/29/2023	40	below	1X48" intake at 35%, 1x48" discharge at 70%. Tide low, flood, spring tides cont.
11	E11-3	9/5/2023	54	below	1X48" intake at 35%, 1x48" discharge at 70%. **Reduced discharge to 0% (CLOSED), Increased intake to 90%** for salinity. Tide low, ebb, spring tides cont.
11	E11-3	9/14/2023	36	0.70	1X48" intake at 90%, 1x48" discharge at 0% (CLOSED). **Opened discharge to 50%**, sal. has reduced, red. WSE for fall ops, leave intake high to maintain sal. Tide low, flood, neap tides cont.
11	E11-3	9/21/2023	46	below	1X48" intake at 90%, 1x48" discharge at 50%. **Reduced discharge to 0% (CLOSED)** for salinity. Tide low, flood, neap tides cont.
11	E11-3	9/26/2023	41	0.80	1X48" intake at 90%, 1x48" discharge at 0% CLOSED. **Opened discharge to 50%,** maintain winter ops WSE**.** Tide low, flood, spring tides cont.
11	E11-3	10/4/2023	41	0.50	1X48" intake at 90%, 1x48" discharge at 50%. **Reduced discharge to 15%**. Tide low, flood, spring->neap tides.
11	E11-3	10/11/2023	40	0.80	1X48" intake at 90%, 1x48" discharge at 15%. **Increased discharge to 20%**. Tide low, ebb, neap->spring tides.
11	E11-3	10/19/2023	39	0.6	1X48" intake at 90%, 1x48" discharge at 20%. **Reduced discharge to 15%** to incr. WSE. Tide low, flood, neap tides cont.
11	E11-3	10/26/2023	37	0.9	1X48" intake at 90%, 1x48" discharge at 15%. **Increased discharge to 20%**. Tide high, flood, neap->spring tides.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
12	E12-1	5/4/2023	30	7*	2x48" intakes at 2X100%, 2x48" discharge at 2x0% (**CLOSED**).
13	E13MB - WCS	5/4/2023	25	5.7*	2x36" Intakes (1x25%, 1x50%), 1x100% Open cont. 2x36" Discharge Open 100% Cont. weir boards set at ~5.3ft. Tide high, flood.
13	E13MB - WCS	6/2/2023	33	5.6*	2x36" Intakes (1x25%, 1x50%), 1x100% Open cont. 2x36" Discharge Open 100% Cont. weir boards set at ~5.3ft. Tide low, flood.
13	E13MB - WCS	7/6/2023	32	5.95*	2x36" Intakes (1x25%, 1x50%), 1x100% Open cont. 2x36" Discharge Open 100% Cont. weir boards set at ~5.3ft. Tide low, ebb.
13	E13MB - WCS	8/4/2023	38	5.7*	2x36" Intakes (1x25%, 1x50%), 1x100% Open cont. 2x36" Discharge Open 100% Cont. weir boards set at ~5.3ft. Tide low, flood.
13	E13MB - WCS	9/5/2023	43	5.3*	2x36" Intakes (1x25%, 1x50%), 1x100% Open cont. 2x36" Discharge Open 100% Cont. weir boards set at ~5.3ft. Tide low, flood.
13	E13MB - WCS	10/4/2023	43	5.4*	2x36" Intakes (1x25%, 1x50%), 1x100% Open cont. 2x36" Discharge Open 100% Cont. weir boards set at ~5.3ft. Tide low, flood.
13	E13MB - WCS	10/26/2023	40	6*	2x36" Intakes (1x25%, 1x50%), 1x100% Open cont. 2x36" Discharge Open 100% Cont. weir boards set at ~5.3ft. Tide high, ebb.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
14	E14-E8X WCS	5/11/2023	25	5.2*	1x48" discharge at 10%, 1x48" intake at 25%. **Reduced intake to 10%**. Maintain WSE to protect WSP nests. Tide low, ebb, spring tides cont.
14	E14-E8X WCS	5/15/2023	25	5.05*	1x48" discharge at 10%, 1x48" intake at 10%. **Increased intake to 25%,** WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide high, flood, spring tides cont.
14	E14-E8X WCS	5/31/2023	30	5.1*	1x48" discharge at 10%, 1x48" intake at 25%. **Reduced intake to 10%, increased discharge to 25%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, flood, neap->spring tides.
14	E14-E8X WCS	6/28/2023	NA	NA	1x48" discharge at 25%, 1x48" intake at 10%. **Reduced intake to 0% (CLOSED)**. WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, ebb, spring tides cont.
14	E14-E8X WCS	7/6/2023	22	4.8*	1x48" discharge at 25%, 1x48" intake 0% (CLOSED)**. Opened intake to 10%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, ebb, spring->neap tides.
14	E14-E8X WCS	45119	35	5.1*	1x48" discharge at 25%, 1x48" intake 10%. **Reduced intake to 0% (CLOSED)**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide high, ebb, spring tides cont.
14	E14-E8X WCS	7/18/2023	34	4.65*	1x48" discharge at 25%, 1x48" intake 0% (CLOSED). **Opened intake to 5%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, ebb, spring->neap tides.
14	E14-E8X WCS	7/21/2023	30	4.7*	1x48" discharge at 25%, 1x48" intake 5%. **Increased intake to 10%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, ebb, spring->neap tides.
14	E14-E8X WCS	7/28/2023	NA	4.9*	1x48" discharge at 25%, 1x48" intake 10%. **Reduced intake to 0% (CLOSED)**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Neap->king tides.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
14	E14-E8X WCS	8/4/2023	44	4.5*	1x48" discharge at 25%, 1x48" intake 0% (CLOSED). **Opened intake to 5%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, ebb, end of king tides.
14	E14-E8X WCS	8/17/2023	35	4.8*	1x48" discharge at 25%, 1x48" intake 5%. **Increased intake to 10%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide high, flood, spring ->neap tides.
14	E14-E8X WCS	8/29/2023	37	5.1*	1x48" discharge at 25%, 1x48" intake 10%. **Reduced intake to 5%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, flood, spring tides cont.
14	E14-E8X WCS	9/5/2023	34	4.9*	1x48" discharge at 25%, 1x48" intake 5%. **Increased intake to 10%**, no more WSP nests. Tide low, flood, spring->neap tides.
14	E14-E8X WCS	10/26/2023	41	5.2*	1x48" discharge at 25%, 1x48" intake 10%. **Reduced intake to 5%**. Tide high, ebb, neap ->spring tides.
14	E14-E9 WCS	5/4/2023	30	NA	1x48" discharge at 20%, 1x48" intake at 10%. Staff dirty. Tide high, flood, neap->spring tides; rain.
14	E14-E9 WCS	5/11/2023	27	5*	1x48" discharge at 20%, 1x48" intake at 10%. **Increased discharge to 25%**. Tide high, ebb, neap->spring tides.
14	E14-E9 WCS	6/8/2023	30	~4.8*	1x48" discharge at 25%, 1x48" intake at 10%. Staff dirty. **Reduced intake to 0% (CLOSED)**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, ebb, spring tides cont.
14	E14-E9 WCS	6/26/2023	35	below*	1x48" discharge at 25%, 1x48" intake at 0%. Staff dirty. **Opened intake to 5%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide high, ebb, neap tides cont.
14	E14-E9 WCS	6/28/2023	NA	NA	1x48" discharge at 25%, 1x48" intake at 5%. Staff dirty. **Reduced intake to 0% (CLOSED), reduced discharge to 5%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, ebb, spring->neap tides.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
14	E14-E9 WCS	7/3/2023	30	~4.6*	1x48" discharge at 5%, 1x48" intake at 0% (CLOSED). Staff dirty. **Increased discharge to 25%,** WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide high, flood, spring tides cont.
14	E14-E9 WCS	7/6/2023	NA	NA	1x48" discharge at 25%, 1x48" intake at 0% (CLOSED). **Increased intake to 5%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, ebb, spring tides cont.
14	E14-E9 WCS	7/18/2023	NA	below*	1x48" discharge at 25%, 1x48" intake at 5%. **Increased intake to 10%, reduced discharge to 20%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, flood, spring->neap tides.
14	E14-E9 WCS	7/21/2023	35	below*	1x48" discharge at 20%, 1x48" intake at 10%. **Increased discharge to 25%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, ebb, spring tides cont.
14	E14-E9 WCS	7/28/2023	NA	below*	1x48" discharge at 25%, 1x48" intake at 10%. **Reduced intake to 0% (CLOSED)**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. King tides cont.
14	E14-E9 WCS	8/4/2023	NA	below*	1x48" discharge at 25%, 1x48" intake at 0% (CLOSED). **Opened intake to 10%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, flood, king->neap tides.
14	E14-E9 WCS	8/24/2023	40	below*	1x48" discharge at 25%, 1x48" intake at 10%. **Reduced intake to 5%**, WCS set as necessary for WSE to prevent flooding and protect WSP nests. Tide low, ebb, neap->spring tides.
14	E14-E9 WCS	9/5/2023	39	below*	1x48" discharge at 25%, 1x48" intake at 5%. **Increased intake to 10%,** no more WSP nests. Tide low, flood, spring->neap tides.
14	E14-E9 WCS	9/26/2023	39	5.1*	1x48" discharge at 25%, 1x48" intake at 10%. **Increased discharge to 35%, reduced intake to 7%**. Tide high, flood, neap->spring tides.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
14	E14-E9 WCS	10/4/2023	39	~4.9*	1x48" discharge at 35%, 1x48" intake at 7%. **Reduced discharge to 10%**. Tide low, flood, spring->neap tides.
14	E14-E9 WCS	10/11/2023	40	~5.1*	1x48" discharge at 10%, 1x48" intake at 7%. **Increased discharge to 25%**. Tide low, ebb, neap->spring tides.
14	E14-E9 WCS	10/19/2023	40	NA	1x48" discharge at 25%, 1x48" intake at 7%. **Increased intake to 10%, reduced discharge to 15%,** incr. WSE. Tide low, flood, neap tides cont.
14	E14-E9 WCS	10/26/2023	40	5.3*	1x48" discharge at 15%, 1x48" intake at 10%. **Reduced intake to 5%, increased discharge to 25%**. Tide high, ebb, neap->spring tides.
6A	E6A-10	5/4/2023	18	NA	1x48" discharge open 100%, 1x48" intake open 20%. **Reduced intake to 15%**. Tide low, flood, neap-<spring tides; rain.
6A	E6A-10	5/18/2023	NA	NA	1x48" discharge open 100%, 1x48" intake open 15%. **Increased intake to 25%**, to incr. WSE. Tide high, ebb, spring tides cont.
6A	E6A-10	5/31/2023	20	NA	1x48" discharge open 100%, 1x48" intake open 25%. **Reduced intake to 10%**. Tide high, ebb, neap->spring tides.
6A	E6A-10	6/21/2023	26	NA	1x48" discharge open 100%, 1x48" intake open 10%. **Increased intake to 20%**. Tide low, flood, spring->neap tides.
6A	E6A-10	6/26/2023	25	NA	1x48" discharge open 100%, 1x48" intake open 20%. **Reduced intake to 10%**. Tide low, ebb, neap->spring tides.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
6A	E6A-10	7/3/2023	25	NA	1x48" discharge open 100%, 1x48" intake open 20%. **Reduced intake to 10%** to maintain WSE. Tide high, flood, spring tides cont.
6A	E6A-10	7/6/2023	NA	NA	1x48" discharge open 100%, 1x48" intake open 10%**. Increased intake to 15%.** Tide low, flood, spring->neap tides**.**
6A	E6A-10	7/28/2023	NA	NA	1x48" discharge open 100%, 1x48" intake open 15%. **Reduced intake to 5%**, king tides, WCS set as necessary for WSE to prevent flooding of WSP nests.
6A	E6A-10	8/4/2023	31	NA	1x48" discharge open 100%, 1x48" intake open 5%. **Increased intake to 15%** to incr. WSE. Tide low, ebb, end of king tides.
6A	E6A-10	8/17/2023	30	NA	1x48" discharge open 100%, 1x48" intake open 15%. **Increased intake to 25%**. Tide low, flood, spring->neap tides.
6A	E6A-10	8/24/2023	37	NA	1x48" discharge open 100%, 1x48" intake open 25%. **Reduced intake to 10%**. Tide low, ebb, neap->spring tides.
6A	E6A-10	9/5/2023	34	NA	1x48" discharge open 100%, 1x48" intake open 10%. **Increased intake to 20%**. Tide low, ebb, spring->neap tides.
6A	E6A-10	9/26/2023	32	NA	1x48" discharge open 100%, 1x48" intake open 20%. **Increased intake to 100%, reduced discharge to 25%**, transition to winter ops. Tide high, ebb, spring tides cont.
6A	E6A-10	10/4/2023	36	NA	1x48" discharge open 25%, 1x48" intake open 100%. **Reduced discharge to 10%.** Tide low, ebb, spring->neap tides.
6A	E6A-10	10/11/2023	41	NA	1x48" discharge open 10%, 1x48" intake open 100%. **Increased discharge to 15%.** Tide low, ebb, neap->spring tides.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
6A	E6A-10	10/19/2023	39	NA	1x48" discharge open 15%, 1x48" intake open 100%. **Reduced discharge to 10%** to maintain WSE. Tide low, neap tides cont.
6A	E6A-10	10/26/2023	34	NA	1x48" discharge open 10%, 1x48" intake open 100%. Leave discharge low, incr. WSE. Tide high, flood, spring tides cont.
6B	E6A-2	5/4/2023	25	NA	1x48" discharge gate 75% open, 1x48" intake closed (broken). Tide low, flood, neap->spring tides; rain.
6B	E6A-2	5/18/2023	NA	NA	1x48" discharge gate 75% open, 1x48" intake closed (broken). **Reduced discharge to 50%**, incr. WSE. Tide high, ebb, spring tides cont.
6B	E6A-2	5/31/2023	30	NA	1x48" discharge gate 50% open, 1x48" intake closed (broken). **Increased discharge to 75%.** Tide high, flood, neap->spring tides.
6B	E6A-2	6/14/2023	30	NA	1x48" discharge gate 75% open (over WSE), 1x48" intake closed (broken). **Increased discharge to 100%**. Tide high, flood, neap->spring tides.
6B	E6A-2	6/21/2023	40	NA	1x48" discharge gate 100% open, 1x48" intake closed (broken). **Reduced discharge to 50%.** Tide low, ebb, spring->neap tides.
6B	E6A-2	6/26/2023	42	NA	1x48" discharge gate 50% open, 1x48" intake closed (broken). **Increased discharge to 75%**, Tide low, ebb, neap->spring tides.
6B	E6A-2	7/6/2023	NA	NA	1x48" discharge gate 75% open, 1x48" intake closed (broken). **Reduced discharge to 50%**. Tide low, ebb, spring->neap tides.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
6B	E6A-2	7/12/2023	37	NA	1x48" discharge gate 50% open, 1x48" intake closed (broken). **Increased discharge to 75%**. Tide high tide, ebb, neap->spring tides.
6B	E6A-2	7/21/2023	41	NA	1x48" discharge gate 75% open, 1x48" intake closed (broken). **Increased discharge 100%**, decr. WSE before king tides. Tide low, ebb, spring->neap->king tides.
6B	E6A-2	8/4/2023	39	NA	1x48" discharge gate 100% open, 1x48" intake closed (broken). **Reduced discharge to 70%**. Tide low, ebb, end of king tides->neap.
6B	E6A-2	8/11/2023	35	NA	1x48" discharge gate 70% open, 1x48" intake closed (broken). **Increased discharge to 80%** to maintain WSE. Tide high, flood, spring tides cont.
6B	E6A-2	8/17/2023	40	NA	1x48" discharge gate 80% open, 1x48" intake closed (broken). **Reduced discharge to 50%**. Tide low, flood, spring->neap tides.
6B	E6A-2	8/24/2023	36	NA	1x48" discharge gate 50% open, 1x48" intake closed (broken). **Increased discharge to 75%**. Tide low, ebb, neap->spring tides.
6B	E6A-2	8/29/2023	40	NA	1x48" discharge gate 75% open, 1x48" intake closed (broken). **Reduced discharge to 60%** to maintain WSE. Tide low, flood, spring tides cont.
6B	E6A-2	9/5/2023	39	NA	1x48" discharge gate 60% open, 1x48" intake closed (broken). **Reduced discharge to 40%**. Tide low tide, ebb, spring->neap tides.
6B	E6A-2	9/26/2023	36	NA	1x48" discharge gate 40% open, 1x48" intake closed (broken). **Increased discharge to 75%**, keep dry for WSP flock. Tide high, ebb, neap->spring tides.
6B	E6A-2	9/27/2023	NA	NA	1x48" discharge gate 75% open, 1x48" intake closed (broken). **Reduced discharge to 25%**, transition to winter ops. Tide high, ebb, spring tides cont.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
6B	E6A-2	10/4/2023	41	NA	1x48" discharge gate 75% open, 1x48" intake closed (broken). **Reduced discharge to 10%**, transition to winter ops. Low, ebb, spring tides cont.
6B	E6A-2	10/11/2023	41	NA	1x48" discharge gate 10% open, 1x48" intake closed (broken). **Increased discharge to 15%.** Tide low, ebb, neap->spring tides.
6B	E6A-2	10/19/2023	44	NA	1x48" discharge gate 15% open, 1x48" intake closed (broken). **Reduced discharge to 5%** to maintain WSE. Tide low, ebb, neap tides cont.
6B	E6A-2	10/26/2023	41	NA	1x48" discharge gate 5% open, 1x48" intake closed (broken). **Increased discharge to 15%**. Tide high, flood, neap->spring tides.
8	E6A-1	5/4/2023	25	<5*	1X48" intake at 35%, 1X48" discharge at 75%. Tide low, flood, neap->spring tides; rain.
8	E6A-1	5/11/2023	27	<5*	1X48" intake at 35%, 1X48" discharge at 75% (but above WSE). **Reduced intake to 25%**. Tide low, ebb, neap->spring tides.
8	E6A-1	5/15/2023	25	<5*	1X48" intake at 25%, 1X48" discharge at 75% (but above WSE). **Reduced intake to 10%.** Tide high, flood, neap->spring tides.
8	E6A-1	5/18/2023	NA	<5*	1X48" intake at 10%, 1X48" discharge at 75% (but above WSE). **Increased intake to 25%**, incr. WSE. Tide low tide, ebb, spring tides cont.
8	E6A-1	5/22/2023	28	4.95*	1X48" intake at 25%, 1X48" discharge at 75% (but above WSE). **Increased intake to 50%**. Tide low, ebb, spring->neap tides.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
8	E6A-1	5/31/2023	28	5.2*	1X48" intake at 50%, 1X48" discharge at 75% (but above WSE). **Reduced intake to 15%**. Tide high, flood, neap->spring tides.
8	E6A-1	6/21/2023	32	<5*	1X48" intake at 15%, 1X48" discharge at 75% (but above WSE). **Increased intake to 50%.** Tide low, ebb, spring->neap tides.
8	E6A-1	6/26/2023	38	<5*	1X48" intake at 50%, 1X48" discharge at 75% (but above WSE). **Reduced intake to 25%**. Tide low, ebb, neap->spring tides.
8	E6A-1	7/3/2023	34	<5*	1X48" intake at 25%, 1X48" discharge at 75% (but above WSE). **Reduced intake to 10%,** WCS set as necessary for WSE to prevent flooding of WSP nests. Tide low, flood, spring tides cont.
8	E6A-1	7/6/2023	NA	<5*	1X48" intake at 10%, 1X48" discharge at 75% (but above WSE). **Increased intake to 15%**. Tide low, spring->neap tides.
8	E6A-1	7/21/2023	34	<5*	1X48" intake at 15%, 1X48" discharge at 75% (but above WSE). **Reduced intake to 10%,** WCS set as necessary for WSE to prevent flooding of WSP nests. Tide low, ebb, spring tides cont.
8	E6A-1	7/28/2023	NA	<5*	1X48" intake at 10%, 1X48" discharge at 75% (but above WSE). **Reduced intake to 5%**, king tides cont.
8	E6A-1	8/4/2023	36	<5*	1X48" intake at 5%, 1X48" discharge at 75% (but above WSE). **Increased intake to 10%**. Tide low, ebb, end of king tides->neap.
8	E6A-1	8/17/2023	36	<5*	1X48" intake at 10%, 1X48" discharge at 75% (but above WSE). **Increased intake to 20%**. Tide low, flood, spring->neap tides.
8	E6A-1	8/24/2023	35	<5*	1X48" intake at 20%, 1X48" discharge at 75% (but above WSE). **Reduced intake to 15%**. Tide low, ebb, neap->spring tides.

POND	Location	Date	Salinity (ppt)	Staff (ft.) NGVD unless noted NAVD*	Activity and Notes
8	E6A-1	8/29/2023	40	<5*	1X48" intake at 15%, 1X48" discharge at 75% (but above WSE). **Reduced intake to 5%**, WCS set as necessary for WSE to prevent flooding of WSP nests. Tide low, flood, spring tides cont.
8	E6A-1	9/5/2023	37	<5*	1X48" intake at 5%, 1X48" discharge at 75% (but above WSE). **Increased intake to 10%**. Tide low, ebb, spring->neap tides.
8	E6A-1	9/21/2023	40	4.65*	staff cleaned. 1X48" intake at 10%, 1X48" discharge at 75% (but above WSE). **Reduced intake to 5%**. Tide low, flood, neap->spring tides.
8	E6A-1	9/26/2023	38	<4.5*	1X48" intake at 5%, 1X48" discharge at 75% (but above WSE). **Increased intake to 75%, reduced discharge to 25%**, transition to winter ops. Tide high, ebb, spring tides cont.
8	E6A-1	10/4/2023	40	4.9*	1X48" intake at 75%, 1X48" discharge at 25%. **Reduced discharge to 20%**. Tide low, ebb, spring->neap tides.
8	E6A-1	10/19/2023	39	6.1*	1X48" intake at 75%, 1X48" discharge at 20%. **Increased intake to 100%,** winter ops. Tide low, ebb, neap tides cont.
8	E6A-1	10/26/2023	41	6.4*	1X48" intake at 100%, 1X48" discharge at 20% (discharge appeared to be at 10) **Increased discharge to 15%**. Tide high, flood, neap->spring tides.
8X	E8X-Tidal-E8X new WCS	5/11/2023	25	NA	staff dirty. 1x48" Discharge open 10%, 1x48" Intake open 100%. Tide low, ebb, neap->spring tides.
8X	E8X-Tidal-E8X new WCS	11/14/2023	38	NA	staff dirty. 1x48" Discharge open 10%, 1x48" Intake open 100%. Tide high, flood, spring tides.

Water Quality Monitoring Requirements

Water quality monitoring was conducted at locations shown in Figure 2 for Table 2:

Table 2 Continuous Circulation Period Discharge Limits

All pond waters discharging to the Bay or Sloughs shall meet the following limits:

Parameter	Instantaneous Maximum	Instantaneous Minimum	Units
Salinity	44	n/a	Ppt
Dissolved Oxygen[1]	n/a	5.0	Mg/L
pH[2]	8.5	6.5	

[1]= Basin Plan objective; pond discharges must be > DO receiving waters. DO Trigger: when using a continuous data recorder, if the DO 10th Percentile value is < 3.3mg/L, on a calendar weekly basis, values shall be reported to RWQCB and BMP's implemented as needed.
[2] =The Discharger may determine pH compliance at the discharge or in the receiving water.

Water Quality Monitoring Methodology

Pond Discharge Monitoring/Sampling

In 2023 continuous data were not collected. As previously approved by RWQCB, such data were not required in Pond Systems E2, E2C, E6A/B/8, E8X and E14 in the Final Order. Pond management targeted waterbird habitat objectives and operational changes were made on a weekly, monthly and seasonal basis, based on salinity grab samples, water level monitoring and waterbird use. Pond management conformed to Operations Plans. Pond management is summarized in Table1: Summary of Discharge Activities.

Discharge Time-Period and Volume Estimates

Estimates of discharge volume provide context for pond management but are not easily calculated. RWQCB previously modified ASMR requirements such that volume estimates are not required. Discharge time-period information is a proxy for discharge volume, interpreted from previous monitoring data, observations and predicted tides, as noted below. We assume discharge occurs when tide stage is below pond water elevation, estimated at approximately 13-16 hours daily. This may over-estimate actual discharge time (and volume) because it disregards effects of head (pressure) that may alter discharge flows from culverts with tide gates. Based on observed data, intake requires tide stages that are approximately 1 ½ feet higher than pond water elevations.

Receiving Water Sampling

Receiving water was not monitored in 2023 as previously approved by RWQCB. Ponds E2 and E10 discharge to the Bay, while limited discharge occurs into sloughs via Ponds E2C, E6A, E6B, E8, E8X, E14 and the mixing basin for reconfigured Ponds E12/E13.

Sampling requirements under the Final Order were originally modified by RWQCB in 2008. Receiving water sampling was required only when adverse conditions are observed, concurrent with Pond E2C discharge volumes greater than 25% of capacity of the 2x48" water control structure during the period

May through October. As previously approved by RWQCB, discharges are maintained at greater than 25% capacity to maintain nesting habitat for WSP in ponds E8X, E6B, E6B, E8, and E14, as well as in reconfigured ponds E12 and E13. Table 3 below describes the water quality monitoring requirements for discharge. Type “A” monitoring occurs for all ponds (2018 revision to the Final Order).

Table 3- Water Quality Monitoring for Eden Landing Ponds

Sampling Station:	D.O.	pH	Temp	Salinity	Sample Function
E2-10	A	A	A	A	Discharge
E2C-1 (E2C-14)	A	A	A	A	Discharge
E6A-10	A	A	A	A	Discharge
E6A-2	A	A	A	A	Discharge
E6A-1	A	A	A	A	Discharge
E8X-Tidal	A	A	A	A	Discharge
E12-E13	A	A	A	A	Discharge
E14-E9	A	A	A	A	Discharge

LEGEND FOR TABLE 3

A = Between May and October the Discharger shall collect weekly grab samples of pond water and report standard observations (Section D of the SMP). The Discharger shall alternate the time it collects grab samples, as practicable. Grab samples and standard observations inform pond operations and management.

Calibration and Maintenance:

The refractometer instrument used for salinity sampling as part of the Self-Monitoring Program was calibrated by using pure water to reset the instrument to zero.

Pond Management Sampling:

CDFW regularly conducted sampling in 2023 in all ponds in each system. This data was used to inform pond management and adjust discharge operations. Data include pondwater elevation (staff gages), salinity (hand-held refractometer), wildlife use (observations), meteorological/tidal conditions and physical pond conditions.

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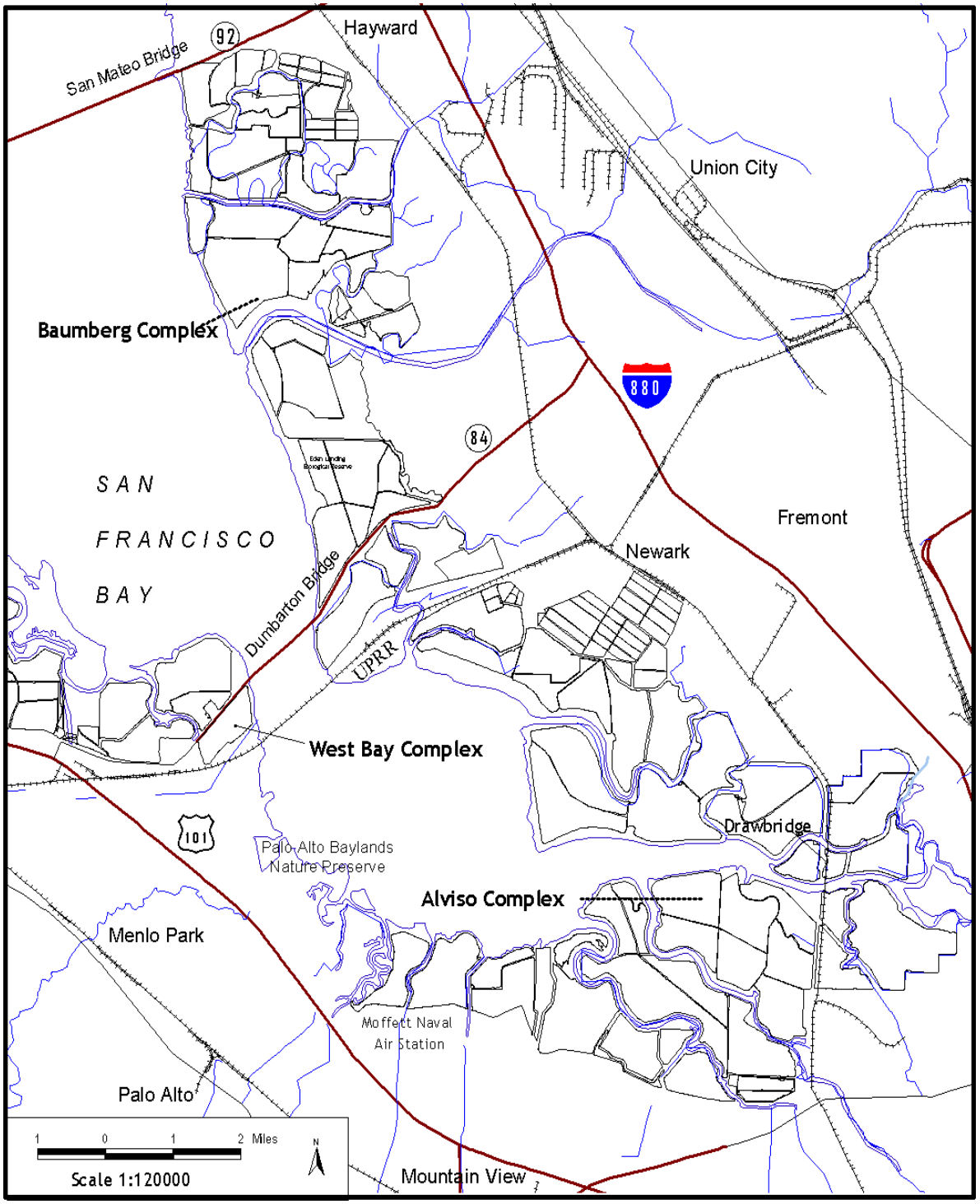

Figure 1. Vicinity Map of the Eden Landing Ecological Reserve (Baumberg Complex)

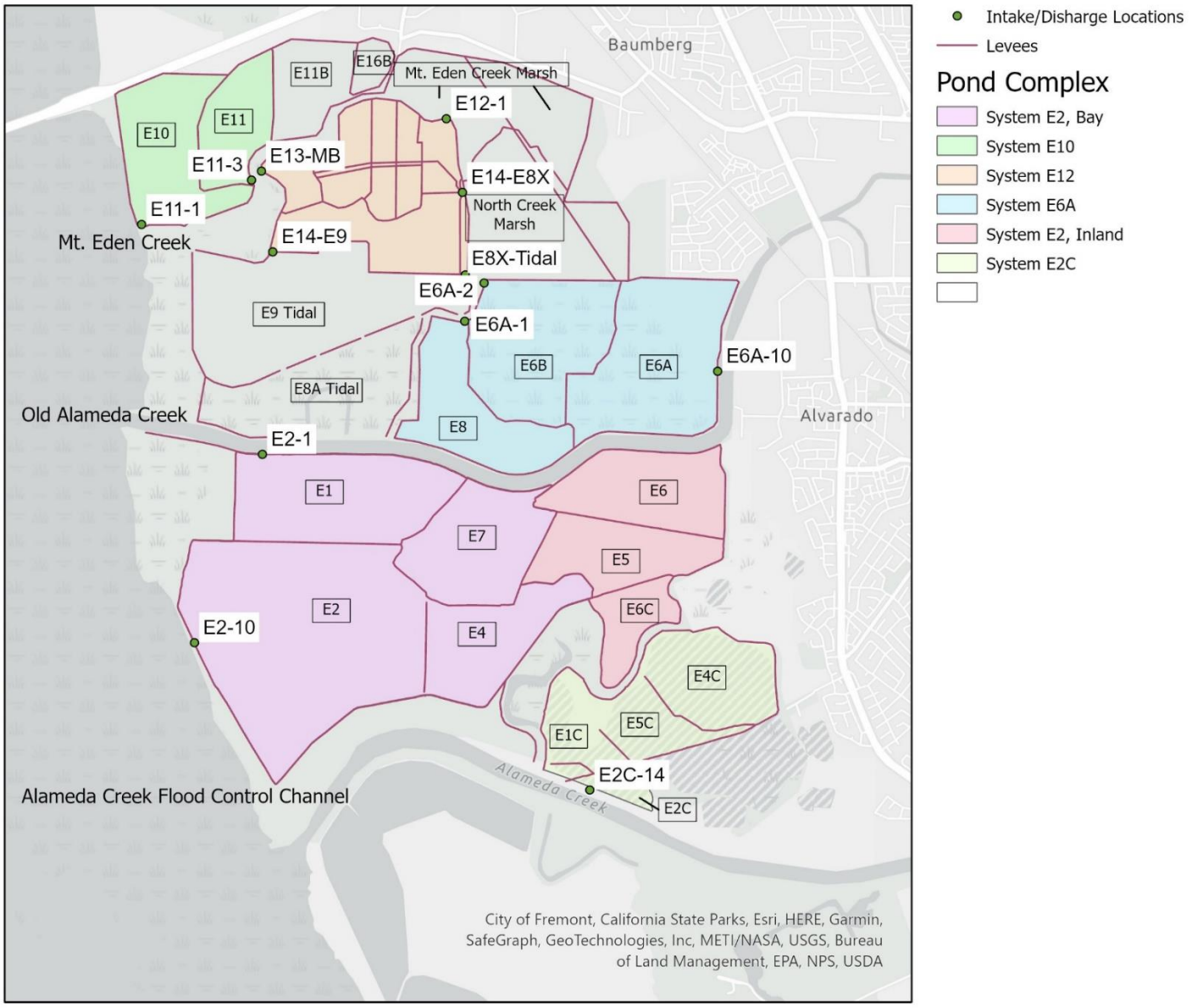

Figure 2. Eden Landing Ecological Reserve (Baumberg Complex) Ponds: Discharge and Intake Locations

Green dots with white text boxes note Intake and Discharge Locations, black text boxes note pond names. (“B” nomenclature from water control structure names for ISP is replaced by “E” in most documents and field notes. SBSP Restoration Project naming convention uses “E” on ponds, WCS)

Water Quality Monitoring Results

Discharge and Receiving Waters

Results from the monitoring of pond waters at discharge locations are summarized below. During the May-September 2023 water quality monitoring season, salinity was generally moderate and appeared

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to follow the typical patterns and ranges as observed in previous years. In 2023 pH, temperature and DO were not monitored directly, as previously approved by RWQCB in the Final Order. It is assumed that those parameters continued the typical patterns and ranges as in previous years based on observed conditions.

Salinity data from 2023 were generally consistent with data collected during previous years in Systems E10, E12/E13, E8X-E14, E6A, E2, E2C, and E10. Low overall rainfall totals in 2023 were consistent with dry years. Salinity was similar to comparative calendar dates during the 2011-2016 drought. In 2023, pond operations sustained continuous circulation with higher discharge settings, high intake and good circulation. Pond discharges do not occur continuously. Pond discharge data review should consider the variation in tide stage and cycles, and pond operations which may affect discharge.

System E6A was successfully managed as a modified seasonal pond system, with salinity and water levels managed for WSP nesting habitat and migratory shorebird foraging in spring through fall, with deeper, low salinity open water habitat in the winter. Modified seasonal operations are typified by large areas of dry, exposed pond bottom, with some shallowly inundated areas, and deeper water levels in circulation primarily within borrow ditches. Overall conditions allowed for continuous circulation discharge below 44 ppt with some exceptions above 44 ppt noted in Table 1 and the data provided electronically.

Reconfigured Ponds E12 & E13 were successfully managed as open water ponds with increasing salinity and nearly constant water levels. This provides shallow, open water for migratory shorebird foraging and roosting habitat across both ponds, with islands as nesting habitat and deeper water levels in borrow ditches. Overall pond conditions within this system allowed for continuous circulation discharge operations below 44 ppt.

Water temperature is generally consistent across wet and dry years. As determined from previous years' data analysis, dissolved oxygen data is difficult to interpret with respect to actions related to management. It is assumed that DO is more related to (in-situ) pond conditions and (external) weather trends. Similarly, pH is also variable and difficult to interpret regarding the effects of management activities. Therefore, pH, temperature and DO are not regularly monitored at ELER.

The 2023 pond water monitoring results (grab samples) and field observations are large files and are not included in this SMR. Rather, this data is provided in electronic format. Pond systems consistently provided good habitat conditions for numerous waterbird species, including migratory shorebirds and waterfowl, resident piscivores and waders.

Table 1 lists the observed (grab sample) values for salinity at the discharge location on dates that changes were made to pond operations. Refer to the electronic pond management and field observations files for more data and other monitoring locations.

Salinity

Pond salinities in 2023 were similar to previous dry years, though higher than observed conditions in 2021, within normal ranges of prior similar water years with below average rainfall conditions (e.g. 2011-2016 drought conditions). For 2023, pond operations and management continued sustained high volume discharges. Salinities were generally maintained below 44 ppt, except as noted. Salinity

values were typically observed during daily tidal flux and pond operations. Refer to Table 1 for observed salinity values, water levels and pond management activities. Refer to detailed pond management electronic data files for overall pond conditions.

All system ponds were observed to maintain generally low salinity operations and typical discharge conditions in 2023. CDFW pond management continues to operate chiefly as low-salinity ponds, with some medium-salinity ponds within some systems, as discussed below. For example, reconfigured ponds E12 and E13 include a series of cells in each pond, with progressively higher salinities maintained, flowing to the E13 mixing basin which generally maintains discharge salinity below 44ppt via intake from and discharge to Mt. Eden Creek and subsequent flows in SF Bay. Differences in mean salinity between low salinity ponds and Bay waters are more apparent during neap tide periods and warm weather periods. Higher salinity is observed during drought years. Review of data collected to date indicates that pond management and operations effectively maintain low salinity discharge in all pond systems, thereby meeting water quality and beneficial use standards. Higher salinity pondwater is sufficiently mixed at the discharge location to adequately protect receiving water quality objectives. Pond Systems in Eden Landing include some seasonal (“dry”) or managed “batch” ponds in summer, which are returned to continuous circulation and low salinity conditions via winter operations.

E2C:

System E2C is operated as a muted tidal pond with intake and discharge at the same location. Salinity varied depending on weather and duration of intake periods from spring and neap tide cycles. During 2023, System E2C was managed with typical operations, as described below. In winter through early spring 2023, salinity values ranged from 5-30 ppt, (30-50 in 2022, 14-50 ppt in 2021, 5-28 ppt in 2020, 2-24 ppt in 2019, 11-32 ppt in 2018, 0-28 ppt in 2017, 0-44 ppt in 2016, 30-33 ppt in 2015, 30 to 35 ppt in 2014, 20 to 36 ppt in 2013, and 23 to 28 ppt in 2012).

Grab sample values during the monitoring season from May to October 2023 showed pond salinities from 20-51 ppt (36-80 ppt in 2022; 20-56 ppt in 2021; 22-72 ppt in 2020; 15-29 ppt in 2019; 26-44 ppt in 2018; 18-41 ppt in 2017; 25-50 ppt in 2016; 33-52 ppt in 2015; 34-48 ppt in 2014; 29-49 ppt in 2013, 30-47 ppt in 2012). The average salinity over the May to October 2023 monitoring season was 34 ppt (50 ppt in 2022; 43 ppt in 2021; 39 ppt in 2020; 22 ppt in 2019; 39 ppt in 2018; 27 ppt in 2017; 37 ppt in 2016; 40 ppt in 2015; 41 ppt in 2014; 46ppt in 2013; and 38 ppt in 2012). Observed E2C salinity was observed above 44 ppt on one day in 2023; 10/19/23 at 51pptppt during drawn down pond conditions (see electronically provided excel data ELER_Pond_Mgmt_2023_ASMR.xlsx for details) (twenty-one dates in 2022, ranging from 45-80 ppt; five days in 2021; 6/16/2021 at 56 ppt, 7/21/21 at 50 ppt, 8/27/2021 at 50 ppt, 9/28/2021 at 49 ppt, and 10/31/2021 at 45 ppt; three days in 2020; 7/7 at 67 ppt, 8/4 at 72 ppt, 8/26 at 50 ppt; zero days in 2019; three days in 2018; 7/19, 54 ppt; 9/14, 47 ppt, 9/18, 45ppt). Pond discharge was minimal during these periods because of reduced gate settings. Elevated salinity values are typically only observed during brief neap tide periods that result from circulation of higher salinity water to a discharge location. Sufficient tidal mixing normally quickly returns salinity below 44 ppt. Best Management Practices (BMPs) for pond operations were typical in 2023, limited to brief periods of discharge volume reduction during neap tides, to maintain appropriate water levels and allow for salinity improvements during spring tides.

Pond E2C regularly had flows to and from Pond E5C (and E4C and E1C). Reduced discharge gate settings between 2-5% were common, discharge gate settings maximized circulation at Pond E2C.

E2:

System E2 is operated as a low salinity continuous circulation system for the season, with primary inflow from E1 and muted tidal intake/discharge directly on the Bay. Discharge was maintained with one gate approximately 25% open except as noted.

Observed salinity at the E2-10 discharge in mid-April, 2023 was approximately 25 ppt (34ppt in 2022, 35 ppt in 2021, 20 ppt in 2020, 14 ppt in 2019, 29 ppt in 2018, 18 ppt in 2017, 31 ppt in 2016, 35 ppt in 2015, 38 ppt in 2014, 40 ppt in 2013, 37 ppt in 2012) and ranged from 25-41 ppt during May-October 2023 (35 to 61 in 2022, 35 to 62 ppt in 2021, 20 to 52 in 2020, 15 to 28 ppt in 2019, 28 to 49 ppt in 2018, 18 to 40 ppt in 2017, 26 to 44 ppt in2016, 37 to 53 ppt in 2015, 35 to 55 ppt in 2014, 39 to 50 ppt in 2013, 29 to 46 ppt in 2012). Salinity for the 2023 monitoring season based on grab samples averaged 36 ppt (55 ppt in 2022, 50 ppt in 2021, 42 ppt in 2020, 22 ppt in 2019, 40 in 2018, 28 ppt in 2017, 38 ppt in 2016, 46 ppt in 2015, 46 ppt in 2014, 40 ppt in 2013, 40 ppt in 2012). Discharge operations helped maintain appropriate salinity values in 2023 below 44 ppt; see ELER_Pond_Mgmt_2023_ASMR.xlsx for details (22 days in 2022; 10 days in 2021; 8 days in 2020; no days in 2019; six days above 44 ppt in 2018). The reduction in observed days with high salinity is likely due to the effects of a wetter than average winter in 2022-2023. Greater intake and discharge volumes at the bayfront WCS may be warranted in dry years to maintain lower salinity, while in wet years to help maintain appropriate water levels. In 2023, no adverse effects were observed. Temporary reduction of discharge settings was implemented, although no complete suspension of discharge (a BMP) was implemented in 2023.

E10:

Normal summer operations occurred in 2023. Discharge maintained appropriate water levels (discharge gate 5-25% open). System E10 was operated in 2023 as shallow open water for the summer, with intake and discharge at the same location (muted tidal operations) at the mouth of MEC. Pond E11 is operated as a seasonal pond and allowed to draw down and partly dry during the summer. E10 salinity in the May-October 2023 monitoring season averaged 34 ppt (44 in 2022; 40 ppt in 2021; 34 ppt in 2020; 14 ppt in 2019; 37 ppt in 2018; 31 ppt in 2017; 32 ppt in 2016; 35 ppt in 2015; 40 ppt in 2014; 36 ppt in 2013) and ranged from 22-48 ppt (35-56 ppt in 2022; 34-45 ppt in 2021; 13- 45 ppt in 2020; 11-17 ppt in 2019; 30-42 ppt in 2018; 23-37 ppt in 2017; 30-35 ppt in 2016; 32-40 ppt in 2015; 38-43 ppt in 2014; 31-43 ppt in 2013; 27-39 ppt in 2012). Before the summer monitoring season, salinity in E10 was approximately 20 ppt in late March 2022 (33 in 2022; 35 ppt in 2021; 13 ppt in 2020; 5 ppt in 2019; 30 ppt in 2018; 7 ppt in 2017; 25 ppt in 2016; 32 ppt in 2015; 33 ppt in 2014; 31 ppt in 2013; 29ppt in 2012). Observed salinity exceed 44 ppt in 2023 on one day, reaching 48 ppt; see ELER_Pond_Mgmt_2023_ASMR.xlsx for details (12 days in 2022, 1 day in 2021, 1 day in 2020, 0 days in 2019, 0 days in 2018, 2017, 2016, 2015, 2014, 2013 and 2012).

The E10 WCS was replaced with a single 48” pipe and combination gates on each side in 2017 and is operating successfully. The pond-to-pond WCS between E10 and E11 was replaced in 2018 with a 36-inch culvert and combination gates on each side.

E11:

The E11 WCS was repaired in May 2020 with a 48-inch culvert and combination gate both sides of the pipe, to allow muted tidal inflow and discharge on Mt. Eden Creek (MEC) and improved circulation operations (E11-3, replaced the former E11 pond side box weir).

E11 salinity in the May-October 2023 monitoring season averaged 36 ppt and ranged from 25-54 ppt (44 ppt and 37-68 in 2022; 41 ppt and 34-45 ppt in 2021). Before the summer monitoring season, salinity in E11 was approximately 25 ppt in April 2023 (34 in 2022; 35 ppt in 2021). Observed salinity exceeded 44 ppt in 2022 on two days, reaching 54 ppt on 9/5/23 and 46 ppt on 9/21/23; see ELER_Pond_Mgmt_2023_ASMR.xlsx for details (eleven days in 2022 ranging 45-68 ppt; one day in 2021, 9/16/21).

E9:

System E9 ponds, including E9, E8A and E8X, were restored to full tidal action in 2011. Seasonal ponds previously operated via pond E9 and are now managed via pond E8X with intake from and discharge to North Creek and Mt. Eden Creek.

E12:

Reconfiguration of Ponds E12 and E13 was completed as part of Phase One of the SBSPRP. System E12 was operated as shallow, open water in 2021 with intake and discharge via MEC. These ponds are managed with nearly constant water levels across three cells in each pond which provide progressively increasing salinities (not maintained in winter), terminating in a mixing basin to ensure low salinity discharge. Pond E8X is operated as a forebay for Ponds E12 and E13 and a mixing basin for pond E14. Brief E12 discharges may be intermittently used to recirculate stagnant water and "reset" water quality parameters by increased circulation. No discharge occurred from Pond E12 at the intake location (E12-1) in 2022 or 2023. Large algal mats were observed but water quality and habitat use were adequately maintained. System E12 met salinity targets in pond cells during the summer discharge monitoring season. Ponds E12 and E13 provided seasonal nesting, foraging and fledging habitat for WSP, and CLT on dry pond bottoms, graveled levees, berms, and islands.

E13:

Grab sample salinity in E13 Mixing Basin was low on most occasions in 2023. E13 Mixing Basin salinity during the May to October 2023 monitoring season averaged 36 ppt (42 in 2022; 38 in 2021; 37 in 2020; 17 in 2019; 37 ppt in 2018; 28 ppt in 2017; 41 ppt in 2016; 40 ppt in 2015) and ranged from 25-43 ppt in 2023 (34-52 in 2022; 30-42 ppt in 2021;12-20 ppt in 2020; 25-67 ppt in 2018; 20-40 ppt in 2017; 32-53 ppt in 2016; 32-50 ppt in 2015). Prior to the start of the 2023 monitoring season, salinity in the E13 Mixing Basin was approximately 28 ppt (35 ppt in 2022; 35 ppt in 2021; 19 ppt in 2020; 10 ppt in 2019; 25 ppt in 2018; 16 ppt in 2017; 32 ppt in 2016; 34 ppt in 2015). In 2023, grab sample salinity exceeded 44 ppt on zero days (nine days in 2022 [45-52 ppt]; zero days in 2021; one day in 2020; zero days in 2019; two days in 2018 [8/17, 67ppt; 9/18, 50 ppt] 0 days in 2017; 8 days in 2016; 2 days in Sept. 2015). WSE fluctuated during neap tide periods and as a result of low intake and discharge operations implemented to protect WSP and CLT nests on dry pond bottom areas.

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E14:

Pond E14 was operated as a seasonal pond in 2023 and allowed to draw down and mostly dry during the summer, with shallow water circulation in the borrow ditches via Pond E8X and E9 tidal areas. The mostly dry pond bottom provided nesting, roosting and foraging habitat for the federally threatened species, western snowy plover (WSP) and California least tern (CLT), as well as other resident waterbirds. Over 180 WSP and CLT nests were monitored in 2023 across ELER, with 39 WSP nests and 22 CLT nests in E14 alone. Pond E14 provided very good habitat conditions for WSP and CLT nesting and fledging habitat, as well as foraging and roosting habitat for other shorebirds in 2023.

Weekly observed salinities were above 44 ppt on zero days in 2023; see excel data for details (fifteen days in 2022; zero days in 2021; five days in 2020). Lower salinity conditions were observed in 2023 in comparison to 2021, 2020, 2019, and 2018, however salinity conditions were higher than normal in 2022. During the 2011- 2016 drought higher salinity was noted in May, June, July, and September. Intake to and discharge from E14 occurs from pond E8X, a de-facto mixing basin for E14 when higher salinity conditions occur in E14. Limited inflow from the Pond E13 Mixing Basin and regular outflow via Pond E8X occurred throughout most of the year. Supplemental intake operations for E14 via former pond E9 occurs also at Mt. Eden Creek.

In April 2023, salinity in E14 at the E9 discharge location was approximately 30 ppt (34 ppt in 2022; 35 ppt in 2021; 20 ppt in 2020; 10 ppt in 2019; 30 ppt in 2018; 12 ppt in 2017; 15ppt in 2016; 60 ppt in 2015). Intake was allowed from E9 in 2023 (ranging from 0-10% during monitoring period), 2022, 2021, and 2020 with discharge primarily from E14 via E8X, to maintain adequate dry nesting areas and shallow foraging habitat for WSP and CLT. E14 salinity at the E9 discharge location was monitored during 2023, salinity was observed to be consistent between May and July, generally observed to be below 44 ppt. At the E14-E9 location, 2023 salinity values averaged 35 ppt and ranged from 27-40 ppt (not collected in 2022; 30-40 ppt and averaged 35 ppt in 2021; 23-42 ppt and averaged 34 ppt in 2016; 35-62 ppt and averaged 45 in 2015; 28-43 and averaged 42 in 2014). At the E14-E8X location, 2023 salinity values ranged from 22-34 ppt and averaged 33 ppt (37-57 ppt and averaged 44 ppt in 2022; 32- 40 ppt and averaged 36 ppt in 2021; 41-60 ppt and averaged 46 ppt in 2020;12-30 ppt and averaged 12 ppt in 2019; 27-41 ppt and averaged 35 ppt in 2018; ranged 16-35 ppt and averaged 28 ppt in 2017).

E8X:

Salinity conditions in E8X at the discharge were consistently below 44 ppt in 2023, approximately 20 ppt from March- May (32 ppt in 2022; 35 ppt in 2021; 15 ppt in 2020; 12 ppt in 2019; 25 ppt in 2018; 13 ppt in 2017; 25 ppt in 2016; 33 ppt in 2015; 32 ppt in 2014; 34 in 2013; 30 ppt in 2012). E8X salinity during the 2023 monitoring season ranged from 25-37ppt (consistently 36ppt in 2022, consistently 35 in 2021; 31-40 ppt in 2020; 15-20 ppt in 2019; 30-41 ppt in 2018; 13-35 ppt in 2017; 25-35 ppt in 2016; 33-45 ppt in 2015; 36-44 ppt in 2014; 32-38 ppt in 2013; 30-42 ppt in 2012). Average salinity in 2023 was 25 ppt (36ppt in 2023; 35 in 2021; 34 ppt in 2020; 18 ppt in 2019; 33 ppt in 2018; 27 ppt in 2017; 35 ppt in 2016; 39 ppt in 2015; 41 in 2014; 36 ppt in 2013; 35 ppt in 2012). Observed salinities were not above 44 ppt in 2023 (0 days in 2022; 0 days in 2021; 0 days in 2020; 0 days in 2019; 0 days in 2018; 2017; 2016 and 2015; in 2014 salinity was above 44 ppt on two dates; salinity did not exceed 42ppt in 2013 or 2012). Active salinity management was limited, as Pond E8X

had typical low salinity conditions throughout the 2023 season. Pond E8X provided good habitat conditions for numerous waterbirds, including piscivores and wading birds.

E6A:

In 2023, System E6A continued operations as a modified seasonal pond system, with continuous circulation via muted tidal intake and discharge at the same locations. Ponds E8, E6B and E6A are managed with a multi-season, multi-species management objective, providing deep water in winter for waterfowl roosting and foraging, and shallow water to partly dry pond bottoms in summer for shorebird foraging, roosting, and nesting. Under modified seasonal operations, salinity is generally low in the borrow ditches that act as water conveyance with continuous circulation and discharge, while some interior areas of the ponds are a mosaic of dry bottom and shallow water areas which have moderate salinity conditions. Salinity is generally below 44 ppt near the discharges and is less varied because the pond is operated at a low water surface elevation with ample mixing.

Grab samples from System E6A routine pond operations prior to May 2023 showed low salinity values consistent with a wet spring. System E6A ponds maintained continuous circulation and discharge salinity was above 44 ppt in 2023 on zero days, pond specific details below. (above 44ppt on twenty days in 2022; above 44 ppt on six days in 2021; below 44ppt in 2020; below 44 ppt in 2019, 2018, 2017 and 2016; above 44 ppt at E6A-10 on one day in August 2015 at 47 ppt).

Salinity in 2023 in pond E6A was monitored at the E6A-10 discharge each month and staff gauge values at WCS E6A-3 nearby were used. Observed salinity ranged from 18-41ppt in 2023 (32-48 ppt in 2022; 29-48 ppt in 2021; 26-38 ppt in 2020; 0-10 ppt in 2019; 20-41 ppt in 2018; 18-21 ppt in 2017; 31-33 ppt in 2016; 29-47 ppt in 2015; 28-41ppt in 2014; 28-44 ppt in 2013; 25-43 ppt in 2012) ([previous ranges including measurements taken at E6A-10 AND E6A-3] 20-48 ppt in 2021; 20-38 ppt in 2020; 0-18 ppt in 2019; 18-21 ppt in 2018; 6-21 ppt in 2017; 15-18 ppt in 2016; 21-25 ppt in 2015; 24-38 ppt in 2014; 19-24 ppt in 2013; 24-26 ppt in 2012). Average salinity at the E6A-10 discharge in pond E6A was 30 ppt in 2023 (41 ppt in 2022; 42 ppt in 2021; 34 ppt in 2020;10 in 2019; 35 ppt in 2018; 23 ppt in 2017; 32 ppt in 2016; 36 ppt in 2015; 41 ppt in 2014; 36 ppt in 2013; 32ppt in 2012). Observed salinity was over 44 ppt at E6A-10 on 0 days in 2023, ranging from 45-48 ppt; see excel data for details (9 days in 2022).

Salinity in 2023 in pond 6B was monitored at the E6A-2 discharge each month and staff gauge values at WCS E6A-3 nearby were used. Observed salinity ranged from 25-44ppt in 2023 (34-60 ppt in 2022; 35-48 ppt in 2021; 34-40 ppt in 2020; 10-28 ppt in 2019; 26-43 ppt in 2018; 7-35 ppt in 2017; 24-42 ppt in 2016; 32-45 ppt in 2015; 32-43 ppt in 2014; 32 to 43 ppt in 2013; 25-38 ppt in 2012) ([previous ranges that include measurements taken at E6A-2 AND E6A-3] 23-48 ppt in 2021; 34-40 ppt in 2020; 10-28 ppt in 2019; 25-30 ppt in 2018; 6-25 ppt in 2017; 20-29 ppt in 2016; 25 to 29 ppt in 2015; 26-34 ppt in 2014; 24-32 ppt in 2013; 26-30 ppt in 2012). Average salinity at the discharge in pond E6B was 36 ppt in 2023 (47 ppt in 2022; 41 ppt in 2021; 36 ppt in 2020; 18 ppt in 2019; 36 ppt in 2018; 27 ppt in 2017; 35 ppt in 2016; 38 ppt in 2015; 39 ppt in 2014; 38 ppt in 2013; 37 ppt in 2012). Observed pond E6B salinity at the E6A-2 discharge was above 44 ppt on 0 days in 2023, see ELER_Pond_Mgmt_2023_ASMR.xlsx for details (20 days in 2022 [45-60 ppt]; 2 days in 2021, 0 days in 2020, 0 days in 2019, 0 days in 2018, 2017 and 2016, 1 day in July 2015 (45ppt)).

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In 2023, observed salinity in pond E8 at discharge E6A-1 ranged from 25-41 ppt (35-51 ppt in 2022; 35-42 ppt in 2021; 29-40 ppt in 2020; 0-17 ppt in 2019; 26-40 ppt in 2018; 16- 32 ppt in 2017; 33-40 ppt in 2016; 32-41 ppt in 2015; 35-39 ppt in 2014; 35 to 37 ppt in 2013; 30 to 44 ppt in 2012) ([previous ranges that include measurements taken at E6A-1 AND at staff in pond 8] 24-42 in 2021; 29-40 ppt in 2020; 0-17 ppt in 2019; 25-28 ppt in 2018; 3-33 ppt in 2017; 15-27 ppt in 2016; 26-32 ppt in 2015; 30-37 ppt in 2014; 24-36 ppt in 2013; 28-38 ppt in 2012). Average salinity in 2023 at the discharge in pond E8 was 34 ppt (42 ppt in 2022; 37 ppt in 2021; 35 ppt in 2020; 10 ppt in 2019; 33 ppt in 2018; 25 ppt in 2017; 37 ppt in 2016; 41 ppt in 2015; 38 ppt in 2014; 36 ppt in 2013; 37 ppt in 2012). Observed pond E8 salinity in 2022 was above 44 ppt at the discharge on 0 days; see ELER_Pond_Mgmt_2023_ASMR.xlsx for details (6 days in 2022 [45-51]; 0 days in 2021; 0 days in 2020; 0 days in 2019; 0 days in 2018; 2017 and 2016; 2 days in May 2015 [57 ppt], September 2015 [47 ppt]; 0 days in 2014; two days in August and September 2013).

pH

For 2023, no Datasondes were utilized to collect instantaneous or continuous pH values.

Temperature

For 2023, no data were collected for instantaneous or continuous temperature values.

Dissolved Oxygen (DO)

Continuous monitoring of dissolved oxygen (DO) was not conducted in 2023, similar to previous years. Two years (2014-15) of continuous data were collected per the Final Order in reconfigured Ponds E12 and E13 as part of SBSPRP Phase One actions. In general, managed ponds appear to meet water quality objectives (WQO) of the Basin Plan, with periodic, short duration periods below those standards.

DO values are known to be highly variable, with a diurnal pattern observed in all years. Regular DO monitoring is no longer conducted as previously approved in revisions to the Final Order. Patterns or periods of low or sustained depressed DO in previous years indicate that achieving compliance with the Final Order continues to be problematic.

In 2023, it is assumed that there were periods of low DO conditions, as were previously observed in managed ponds, including reconfigured ponds E12 and E13. Large algal blooms were not persistent nor perceived as more prevalent than in previous years.

Effectiveness of Dissolved Oxygen Best Management Practices (BMPs) for Pond Management

It is recognized by RWQCB that a well-operated lagoon/pond system may not necessarily continuously meet an instantaneous DO limitation of 5.0 mg/L as specified in the Basin Plan and Final Order. It is also understood that a stringent interpretation of this limit is not necessary to protect water quality, based on review of previous continuous monitoring data and other studies. These data and studies include site-specific standards and monitoring in the Everglades and Virginian Province (Cape Cod, MA to Cape Hatteras, NC), as well as San Francisco Bay studies and data collected by USGS

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in Newark Slough in 2005, 2006 and 2007. Monitoring programs have regularly recorded DO levels lower than 5.0 mg/l in estuaries under natural conditions, thus the phenomenon is not necessarily associated with pond discharges.

Operational strategies (BMPs) may be implemented as needed and described below and in the Pond Operations Plans. CDFW may use BMPs such as the temporary closure of discharge gates during periods when salinity values are at or above 44 ppt, when pond DO may be below 5.0 mg/L standard values. Based on previous years' data, it appears that ceasing discharge for prolonged periods may further degrade water quality. Reducing residence time of water in the ponds appears to improve overall DO levels; therefore, maintaining discharge, particularly at higher sustained volumes, provides for increased circulation and mixing. Muted tidal intake/discharge provides for the greatest circulation and mixing and is generally implemented in all ponds. It is presumed that DO levels in these ponds were similar to ambient conditions in sloughs and the Bay, notably during neap tides, when tidal ranges are more limited. Weekly discharge timing to set pond discharges at greater volumes may occur during spring tide periods to maximize intake, discharge, and mixing.

Refer to Table 1 for a full summary of discharge events and gate settings in 2023.

Compliance Evaluation Summary

Data collected in 2023 were comparable to values from previous years. Monitoring indicates that reconfigured ponds E12 and E13 may be successfully managed to include higher salinity cells, but not significantly improve water quality overall, as compared to typical pond management and water quality in other systems in ELER.

Maintaining dissolved oxygen levels in the ponds within water quality objectives and Final Order requirements is expected to continue to be the most notable management challenge for operation of the ponds. The BMPs developed and implemented as corrective actions as part of the Initial Stewardship Plan and subsequent SBSPRP Phase One actions have maintained, but not improved, water quality parameters including salinity and dissolved oxygen levels in the ponds. It appears that little immediate change within ponds occurs since high residence times are intrinsic to the nature of open-water managed ponds. Improved DO may be the result of a combination of factors, both biotic and abiotic, that are the driving DO dynamics. Based on the observations recorded during pond management and operations, CDFW will continue to determine which operations, management and monitoring activities adequately protect water quality and best achieve Final Order compliance. No large event fish kills have been observed in ELER ponds. Infrastructure improvements, such as major changes in pond management/operations, topography or geometry, do not appear viable as a means of improving compliance with water quality objectives. Intensively managed, reconfigured ponds implemented as part of SBSPRP Phase One actions do not appear to provide the expected improvement in water quality. Pond management is expected to continue to be informed by on-going operations and any future applied studies implemented as part of SBSPRP Phase Two.

In 2023, discharge gates were generally set to allow high discharge volumes, similar to 2022, to decrease residence time and improve mixing. Lower volume discharges were implemented for short periods, though less than in the previous years during drought conditions. More continuous operational periods, rather than intermittent operations, appear to maintain water quality values with respect to salinity and other parameters.

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Data Collection, Evaluation and Communication

In 2023, salinity grab samples and water depth were regularly recorded with general habitat quality and bird use observations. This monitoring continues to be sufficient to manage ponds in accordance with the Final Order. Continuous data recorders were not used in 2023. CDFW provided detailed operations and monitoring data to the RWQCB staff electronically, and data are summarized within this report. Pond management, operations and monitoring was conducted as often as possible by CDFW, given staff limitations. Only one CDFW biologist is available to conduct pond operations, management, monitoring, review, and interpretation of data. Despite on-going challenges, CDFW has successfully managed the pond systems to comply with regulatory standards and continues to provide high-quality waterbird habitat conditions on ELER.

Final Order requirements regarding communication of compliance to the RWQCB were completed electronically, including transmittal of all Excel data on pond management and operations. Continued communication between CDFW and RWQCB staff is useful for on-going pond management and Final Order revisions and compliance.

Summary and Requests for Revisions to SMP:

SBSPRP Phase One actions were completed in 2016 at ELER. Full tidal action was restored to 630-acres of former ponds E9, E8A and E8X in 2011 and establishment of salt marsh vegetation in ponds E9, E8A and E8X continues. Ponds E12 and E13 were reconfigured to create an intake reservoir, six cells (each in a series of three) and a mixing basin within 230 acres of shallow water foraging and roosting areas of increasing salinity with 6 constructed nesting islands. The first full year of operations occurred in 2015. ELER continues to support habitat for fish and wildlife, including special-status species, migratory waterfowl, shorebirds, and anadromous and resident fishes.

The SBSPRP Phase One actions provided recreational use and public access features. CDFW continues to conduct maintenance of berms and levees for habitat management purposes, which are expected to maintain the existing “de-facto” flood risk management.

Management and O & M activities conducted in 2023 adequately addressed the requirements in the Final Order. Pond management, operations, and monitoring activities in 2023 at all ELER pond systems continues to inform management, enhancement and restoration actions and has helped in the development of SBSPRP Phase Two restoration actions. Phase Two at ELER is the subject of the Final Environmental Impact Report completed in 2019. Phase two designs are being completed and permit applications were submitted in 2023 for implementation anticipated in 2025 (depending on permit issuance).

CDFW appreciates the accepted revisions to the Final Order as noted in Table 3 “Water Quality Monitoring For Eden Landing Ponds” which was revised to require only type “A” monitoring activities for CDFW pond operations because discharge at greater than 25% of WCS capacity in pond E2C is not typically sustained. Sustained, higher-volume discharges and corresponding reduced residence time of pond water may improve overall water quality, particularly for DO; therefore, allowing discharges at greater than 25% of WCS capacity provides for increased circulation and mixing. This is particularly important in System E6A, which requires lower water surface elevations to maintain WSP nesting habitat. Maintaining low salinity in continuous circulation operations within borrow

ditches is also important to meet the objective of providing for multi-season, multi-species management of the ponds, including winter operations for diving duck management. System E2 pond discharge may be sustained above 25% because pond E2 discharges directly to the Bay (at E2-10).

Based on monitoring activities associated with the reconfigured Ponds E12 and E13, it appears that use of a mixing basin for discharge may improve water quality of the discharge of managed ponds, or at least improve compliance with water quality objectives. We will continue to collect regular grab samples as part of normal operations.

CDFW will not collect continuous monitoring data in 2024. No revisions are requested.

ATTACHMENT:

2024 Pond Operations Plan

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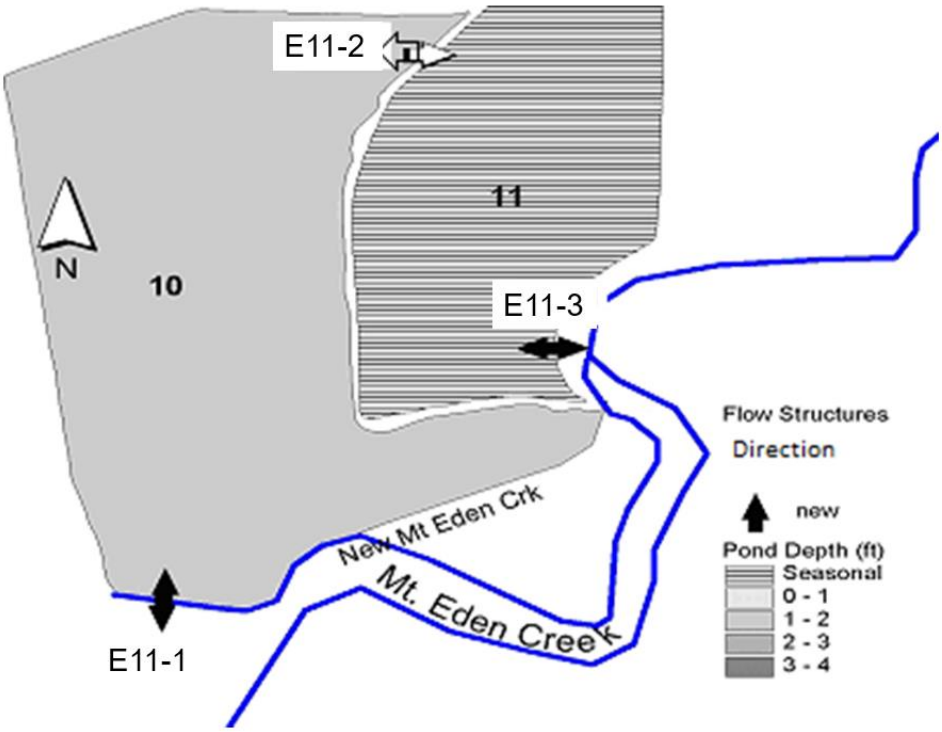
California Department of Fish and Wildlife
Eden Landing Ecological Reserve
Hayward, Alameda County
South Bay Salt Ponds
Operations Plan -- Pond System E10

Regional Water Quality Control Board
San Francisco Bay Region
Final Order Number: R2-2018-0020
(rescinded R2-2012-0014)



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January 2024

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Summary of Annual Operations Plan Conditions

Typical operations are expected. No substantial changes are proposed in System E10 for 2024. California Department of Fish & Wildlife (CDFW) will continue to operate Pond E10 as a continuous circulation, low salinity pond, and pond E11 will continue to be operated as a seasonal pond. In 2017, the Water Control Structure (WCS) in pond E10 was replaced. Similarly, the WCS between Ponds E10 and E11was replaced in 2018. The E11 WCS was repaired in 2020.

Conditions observed in the spring and summer months reflect lower than average rainfall totals in March. Higher than typical salinity values were observed in managed ponds throughout 2022, likely due to drought conditions. Typical salinity values were observed in 2023. Moderate salinity values are maintained in summer with normal operations and sustained high discharge settings, keeping salinity generally below 44ppt. In-pond salinity averages since the 2012-2016 drought have been normal and we maintain continuous circulation during summer with low water levels.

Introduction

This Operations Plan describes pond operations in System E10, management objectives and activities required to meet the overall goals and objectives of the SBSPRP and the requirements in the Regional Water Quality Control Board's (RWQCB) Final Order. Eden Landing Ecological Reserve (ELER), formerly called the Baumberg Complex, commonly referred to as Eden Landing and is owned and operated by California Department of Fish and Wildlife (CDFW). System E10 is operated in the summer as a muted tidal pond (Pond 10) via a water control structure (WCS) adjacent to the mouth of Mt. Eden Creek (MEC). Seasonal pond E11 is allowed to draw down via a WCS located approximately one half mile (½ mi.) upstream on MEC and may be partly dry in summer. The WCS in Pond E10 has one 48" culvert with two combination gates and allows muted tidal intake and discharge. The WCS in Pond E11 has one 48" culvert with two combination gates also providing muted tidal intake and discharge. A detailed description of the System E10 pond operations is provided in the System Description section.

Summer and winter operations and management activities are described in the Management section, and specific corrective measures to adaptively manage the system are described in the Operations, Constraints, and Corrective Measures section.

Eden Landing Ecological Reserve (Baumberg Complex) Location

ELER, formerly called the Baumberg Complex and also referred to as Eden Landing, consists of a 6,400-acre complex of former solar evaporator ponds along the eastern shores of San Francisco Bay in Hayward, Alameda County, and is owned and operated by CDFW. Prior to the 2003 acquisition from Cargill, all ponds within this complex were under Cargill ownership as part of their solar salt production pond system. The approach to the San Mateo Bridge (Highway 92) and the original 835-acre ELER, formerly known as the "Baumberg Tract," forms the northern boundary of the complex. The site is bordered on the east by Old Alameda Creek, residential and commercial areas in the Cities of Hayward and Union City. Alameda Creek Flood Control Channel (aka Coyote Hills Slough) and other Alameda County property and the Coyote Hills Regional Park are near the southern boundary. San Francisco Bay borders the site to the west.

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The main channels within ELER include Mount Eden Creek, North Creek and Old Alameda Creek. Alameda Creek Flood Control Channel is located on the southern perimeter of ELER.

North Creek was restored to tidal action at Old Alameda Creek in April, 2005 and breached into the Eden Landing Ecological Reserve (Baumberg Tract) restoration site 1 miles upstream in October 2006. Mt. Eden Creek was restored to tidal action at the Bay in November 2006 and breached into the Eden Landing Ecological Reserve (Baumberg Tract) restoration site 2 miles upstream in October 2008. Several hundred acres of extant tidal marsh front the San Francisco Bay, known as the Whale's Tail Marsh, are at the Bayfront near the center of the complex. This marsh is located outboard of former Ponds E9 and E8A, between Mount Eden Creek and Old Alameda Creek and along the western perimeter of Pond E1 and a portion of Pond E2.

System E10

System E10 is 332 acres in size; it includes Pond E10 (214 acres) and Pond E11 (118 acres) and is located in the northwest portion of ELER, immediately south of State Highway 92. In 2011, the southwestern-most portion of the Pond E10 levee at Eden Landing Ecological Reserve (ELER) was realigned as part of Phase One of the South Bay Salt Ponds Restoration Project (SBSPRP). The pond E10 levee along Mt. Eden Creek (MEC) was set back to accommodate scour in MEC expected to occur as a result of full tidal action in Pond E9. These ponds are most easily accessed from the Bay Trail Staging Area at the south end of Eden Landing Road. The average bottom elevation of these ponds is 2.6' NGVD and water surface elevations in the ponds vary between 3.5' to 4.2' in summer and winter, respectively.

Biological Resources

Many waterbird species are known to use System E10 and are briefly summarized herein; pond management and operations target suitable habitat for species which prefer open water in managed ponds, or shallowly inundated to dry seasonal ponds. For a more complete discussion of these species, refer to the Final EIR/EIS for the SBSPRP (2007) and SBSP Initial Stewardship Plan (2004). Pond E10 is characterized by low salinity and constant ponding of a foot or more. This pond system typically supports waterfowl in winter including scaup, ruddy duck, northern shoveler and pintail, as well as resident and migratory piscivores, including double-crested cormorant, white pelican, and least, Forster's, and Caspian terns. Islands in Pond E10 provide nesting and roosting sites for terns, American avocets, and black-necked stilts and are used by double-crested cormorants and pelicans as roost sites. Given historic and current pond depths, pond E10 is not heavily used by shorebirds as are other shallower ponds in the complex. Pond E11 does support foraging and roosting by migratory shorebirds in the spring as it is drawn down after being flooded in winter, and in the fall when shallowly reflooded after being dry during the summer. Medium sized shorebirds such as stilts, avocets and willets often use these ponds for roosting in winter in shallowly flooded areas.

Pond E10 is operated as a muted tidal pond, characterized by intake and discharge at the same location. Under summer conditions, shallower water provides good foraging habitat for waterbirds while maintaining island habitat suitable for breeding. The small islands in Pond E10 are likely to be used for nesting by terns, avocets, and stilts, and are often used by other species as roosting sites. Pond E11 has shallower water depths, particularly in the spring and fall, which will provide enhanced shorebird foraging and roosting habitat and is typically dry in summer (seasonal pond). The outboard

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mudflats, open bay and Mt. Eden Creek and ponds now restored to full tidal action provide diverse habitats for additional foraging opportunities. In winter, deeper water conditions target waterfowl use of E10 and E11.

E10 System Description

Objectives

System E10 operations maintain year-round open water habitat in Pond E10, while E11 is mostly drawn down and partly dry (with intake or discharge within the borrow ditches) in summer. Pond E11 may be utilized by western snowy plover (WSP) for foraging and nesting habitat in summer, as it is adjacent to other WSP management ponds and provides dry pond bottom as nesting and foraging habitat.

Both ponds have shallower water conditions in the fall and spring, with deeper open water habitat in winter. Ponds E10 and E11 are utilized by piscivores such as terns, egrets, cormorants and pelicans, waders such as avocets and stilts, and over-wintering waterfowl (dabbling and diving ducks) such as shoveler, widgeon, scaup and ruddy duck. Operations maintain muted tidal circulation (intake and discharge at the same locations) in Ponds E10 and E11. Discharge to the bay from Pond E10 occurs at the mouth of Mount Eden Creek (MEC) and from E11 discharge is approximately 1/4 mile upstream.

Operations

Pond management objectives include:

- Open water (~1-2’ deep), muted tidal operations in E10 via WCS E11-1.
- Seasonal pond operations in E11; draw down in spring for wet bottom exposure, circulation in borrow ditches in Summer, and open water (1’ deep), muted tidal/continuous circulation operations in Winter. Pond E11 is shallowly flooded for shorebirds year round and deepened for seasonal migrant and overwintering waterbirds beginning in Fall via intake at E11-3 (combination gates) and/or flow from E10 at the E11-2 WCS which has a 36” pipe with two combination gates.

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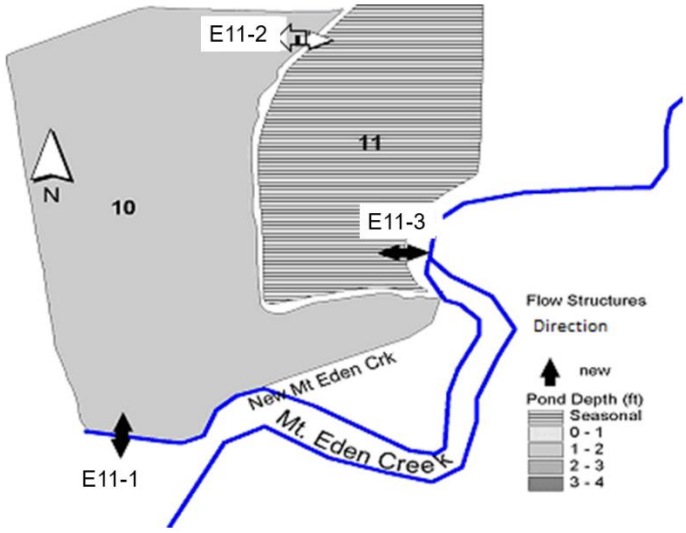
Figure 1. Map of Ponds and Water Control Structures



Management Operations

Pond E10 is operated as a muted tidal, year-round open water pond with intake and discharge via the WCS at the mouth of MEC (E11-1). The Pond E11 bottom is typically dry or very shallow in the summer (seasonal pond), and is flooded in fall and winter with E10 inflow (culvert WCS E11-2), and muted tidal intake and discharge via the combination gates in MEC (E11-3). There is no pump station in this system. Pond management is required year-round, particularly during the transitions to and from the summer operations. Water surface elevations are controlled by adjusting discharge gate settings in E10 and E11, based on target depth, salinity, weather and tides.

Pond E10 is managed by CDFW as year-round open water, though operated deeper in the winter than the summer. Water levels are mostly consistent depths to assure islands within Pond 10 provide suitable nesting and roosting habitat. Pond E11 is shallower, particularly in the spring and fall, which provides enhanced shorebird foraging and roosting habitat and has a typically dry bottom and water is maintained in the borrow ditch in the summer as a seasonal pond.

The primary intake and discharge WCS (E11-1) is in the southwest end corner of the Pond E10 levee at the mouth of MEC and includes one 48” culvert with combination gates on both sides. Water circulation between Pond E10 and E11 occurs at the northern end of the cross-levee between the ponds by a smaller WCS (E11-2), a 36” culvert with combo gates on both sides. Pond-to-pond water flow may occur in either flow direction as needed. Pond E11 has an intake and discharge WCS (E11-3) connecting to MEC in the south-east corner, a 48” culvert with a combination gate on both sides.

High evaporation rates in summer operations require active management to maintain target water levels and discharge salinity below 44ppt using only gravity inflow into the system. Water level in E10 is typically maintained at approximately 3.5 feet NGVD during the summer. E10 has a pond bottom elevation of approximately 2.2 feet NGVD, therefore water depth is approximately 1 foot over the pond bottom. E11 has a higher bottom elevation, approximately 2.9 feet NGVD, and water depth in borrow ditches is approximately 6 inches or deeper. Operation of E11 in summer at a depth that

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covers the pond bottom significantly increases the surface area and residence time of pond water. E11 is not operated as open water. Summer operations (May to October) are intended to provide adequate intake and circulation flow while meeting water quality and pond management objectives in compliance with the Final Order.

During the winter, E10 is operated with intake and discharge via MEC and provides circulation flow to E11. Pond E10 water surface elevation is approximately 4.1 feet NGVD in winter. E11 is operated with flow from E10 and intake and discharge via MEC. See Table 1 for normal in- and out-flow conditions for each operational period.

Records are kept and evaluated, including any slough monitoring data, as well as the tide levels, pond water levels, and gate settings. The records will be used to evaluate the effects of the pond discharge and to refine future operation plans.

Table 1. Estimated System E10 Inflow and Outflow

Period	Gravity Intake Flow		Discharge Flow	
	Average	**Peak**	**Average**	**Peak**
Summer	28 cfs 13,000 gpm	348 cfs 156,000 gpm	26 cfs 12,000 gpm	70 cfs 31,000 gpm
Winter	11 cfs 4,900 gpm	318 cfs 144,000 gpm	12 cfs 5,200 gpm	65 cfs 29,000 gpm

Descriptions of Seasonal Operations

Winter

Winter operations are deeper, continuous circulation in System E10 compared with shallower muted tidal intake and discharge during summer operations. Evaporation is normally minimal during the winter. Winter operations operated E10 with intake at the mouth of MEC and circulation flow through the culvert from Pond E10 to Pond E11. Discharge occurs from E11 via MEC through combination gates at WCS E11-3. Some discharge occurs at the WCS in E10, as needed. Supplemental intake to E11 maintains target conditions. Winter operations (November through March) typically reduce salinity in Ponds E10 and E11 to 20-30ppt.

Table 2. Winter Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
E10	214	2.2	4.2*	6.5
E11	118	2.9	4.0	1.1

Table 3. Typical Winter Gate Settings

Gate	Setting (% open)
Pond E10 intake (E11-1)	25-100* (1 gate)
Pond E10 discharge (E11-1)	0-25* (1 gate)
Pond E11 intake (E11-3)	25-100* (1 gate)
Pond E11 discharge (E11-3)	0-25 (1 gate)

* May be adjusted when water surface elevation is too high.

Summer

Summer operations are typically from May through October. In the spring, the system is transitioned from winter to summer operation conditions and drawn down, usually between mid- March and early April, depending on seasonal rainfall and habitat conditions in the ponds. The transition may be delayed or advanced based on migratory bird pond use or for salinity management. Pond levels are lowered gradually in March to enhance foraging and roosting opportunities for migratory shorebirds, particularly in pond E11.

Summer operation provides adequate circulation to maintain water quality objectives while replacing water lost to evaporation (approx. 2 ac-ft/day) to maintain target depth and salinity.

Table 4. Summer Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
E10	214	2.2	3.5	6.0
E11	118	2.9	2.9 or dry	0.0 or below

Table 5. Summer Gate Settings

Gate	Setting (% open)
Pond 10 Intake (E11-1)	100
Pond 10 Discharge (E11-1)	10-25 (1 gate)
Pond 11 Intake (E11-3)	0-100*
Pond 11 Discharge (E11-3)	10-25 *

* Depending on management objective.

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Summer gate settings are adjusted based on field observations and assumes average evaporation and tide conditions. The gate settings will be sufficient for muted-tidal circulation in E10 and within the borrow ditch of E11 and maintain salinity below 44 ppt.

Constraints and Corrective Measures

Constraints

The primary constraint in operating the E10 system is the relatively high pond bottom and residence time with shallow water and limited gravity inflow maintain circulation in the summer and discharge salinity below 44ppt in E11. E11 is operated as a seasonal pond with circulation in borrow ditches and to minimize surface to volume ratio within the system, reducing overall evaporation and concentration within the extent of shallow, warm water conditions. Allowing E11 to draw down and be partially dry restricts algal blooms and diurnal DO fluctuations in managed open water ponds. Best Management Practices (BMPs) are used as necessary to protect water quality.

Corrective Measures

Records are maintained on pond water levels, salinity grab samples and bird use. Tide levels and gate settings are noted and evaluated to determine optimum operations. The records are used to evaluate the effects of pond management activities on discharge and habitat objectives.

Water Level Control

Pond water level is controlled mainly by discharge gate settings in Ponds E10 and E11 and continuous circulation (directional flow) in Ponds E10 and E11. Low water levels in summer in Pond E11 exposes the pond bottom and circulation is within the borrow ditches in Pond E11.

Discharge gate settings are typically 25% to maintain lower pond water surface elevation in E11, with only higher high tides allowing supplemental intake from Mt. Eden Creek (MEC). Gate settings maintain lower water levels with adequate discharge below 44 ppt. Pond water levels vary by 0.5’ over the course of weeks due to the influence of neap and spring tides and weather.

The E11 WCS at MEC was repaired in 2020. Low water levels in the pond exposes the bottom and may be used for nesting birds but expose nests to predation by mammals and raptors.

Salinity Control

Discharge salinity is generally maintained below 44 ppt under normal operations. Increased outflow decreases the water level in the pond(s) and allows increased inflow at high tide to reduce residence time. Water levels in the ponds are affected by weather and weak or strong tides. Gate settings are periodically adjusted to maintain target WSE and salinity in the ponds.

Dissolved Oxygen Control

This pond system will be mainly operated as directional flow open water in the winter and is expected to maintain adequate Dissolved Oxygen (DO) conditions at the beginning of the summer operations period. In the summer, operations maintain Pond E11 partially dry with circulation within borrow

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ditches. Gate settings are infrequently adjusted and maintain lower water levels and circulation. In some years, large algal mats form in summer and by fall are decomposing, which creates strong diurnal patterns of DO degradation and recovery. DO levels adequately protect receiving waters. When using continuous data collection, a “trigger” for continuous circulation discharge reporting was included in the Final Order. The trigger value is when the weekly 10th percentile value falls below 3.3 mg/L, when using a continuous monitoring device. When DO levels at the pond discharge fall below the trigger value, Best Management Practices (BMPs) listed in this Operations Plan may be used, including additional monitoring, adjusting intake or discharge settings, or temporarily suspending discharge. Timely notification to RWQCB will be made if substantial, adverse conditions are observed.

BMPs include the reducing or closing the discharge during short periods of time when sustained low DO is observed. Discharge settings are adjusted weekly or monthly. Daily discharge timing is not practicable due to staff and budget constraints. Reducing or closing the discharge for a period of days during neap tide periods is limited. Limited intake and circulation/mixing appears to prolong residence time of pond water may not improve DO levels. Therefore, maintaining discharge even at reduced volumes allows increased volume of intake and promotes mixing and circulation. A larger daily volume of water enters the receiving waters, but likely minimizes the duration of low DO potentially affecting receiving waters and may reduce low DO periods.

Dissolved Oxygen BMPs

As noted above, there are a range of BMPs that have been suggested to reduce potential impacts to the DO levels in receiving waters. These BMPs are discussed below:

1. Slough Monitoring

Additional data may be collected to determine if ambient slough conditions meet water quality objectives and if the receiving waters are potentially affected by low DO pond discharge.

2. Adjust Discharge Flow

Discharge may be decreased to reduce the potential effects in receiving waters. Decreasing discharge may immediately minimize low DO entering receiving waters. However, it may prolong the period in which pond water may be subject to low DO conditions since intake is more limited with higher water surface elevation during neap tides. Increased discharge volumes promote intake and mixing during strong (spring) tide periods to improve pond water quality.

3. Monthly Discharge Timing

Water control structures have significant discharge capacity. Discharge is typically less than 25% open in E10 to maintain shallow water and dry pond bottom area. Discharge gates may be set at higher volumes during periods with low tides during the day, when DO is expected to be higher due to algal photosynthesis. When low tides are at night, during those periods gate settings could reduce the volume of discharge when pond DO levels may be lower than ambient.

4. Weekly Discharge Timing

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If DO levels are low for a given week, particularly during neap tides, discharge gates are adjusted approximately weekly to reduce discharge when low tides are at night. Increased discharge occurs when higher tides are at night and discharge occurs mostly during the day when pond DO levels are higher. During summer, DO may be higher from approximately 10 a.m. to 10 p.m. Daily discharge timing is not practicable due to limited staff availability. Increased discharge settings may briefly increase salinity near the discharge in receiving waters, but is not expected to exceed 44 ppt for extended periods as the volume is very small compared to sloughs.

5. Temporarily Cease Discharge

Temporarily ceasing discharge may prevent low DO conditions locally in receiving waters. However, periods without circulation within ponds could prolong adverse water quality conditions in the pond or could result in poorer conditions, depending on weather and other factors. Stagnating water could also have an adverse effect on the biological resources in the ponds. Long periods of suspended discharge could also create substantial odor as accumulated biomass is exposed and decays, affecting sensitive individuals in the neighboring communities. Discharge may be ceased only for short periods (days), such as when salinity is above 44ppt during neap tide periods. Discharge would resume as soon as possible to adequately mix pond water and improve water quality at the discharge, particularly during spring tide periods.

6. Pond to Pond transfer

To reduce salinity and improve DO levels when Pond E10 salinity is near 44ppt, more flow can be drained into Pond E11. This improves turnover of pond water as a result of greater intake volumes and reduced residence times in E10, but may require additional flow in E11.

7. Installation of Baffles

A series of flow diversion baffles installed at the pond discharge to direct the water from more suitable DO waters to achieve maximum oxygen uptake requires frequent maintenance and has been observed to have little effect on pond waters at the discharge. Baffle use is not expected.

8. Mechanically harvest dead algae.

Dead algae may be removed by hand when accumulating at the discharge. If extensive mats are noted in the pond, mechanically harvesting dead algae on a pond wide basis is not practicable.

9. Aeration

Aeration would require installation of bubbler/diffuser systems or floating mechanical aerators near the discharge. The effectiveness of aerators was evaluated by U. S. Fish and Wildlife Service in the Alviso ponds in 2005. The aerators were not effective. This BMP is not expected to be implemented.

pH Control

Pond water pH may be related to DO; however, past evaluation of continuous data did not show direct correlation. High pH (and low DO) appears due to poor circulation and warm temperatures and other abiotic and biotic factors. Past analysis showed pH values generally ranged 6.5 to 8.5, but in

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stagnant areas pH approaches 9.0 or greater. Stagnant waters are usually only found far from discharge locations; therefore, sampling for ammonia in receiving waters has shown little basis for action in previous analysis. Corrective measures above can be used as needed.

Avian Botulism Control

While avian botulism has not been observed in ELER, and is not expected to occur in typically saline conditions. To reduce the likelihood of a severe outbreak of this disease, any dead bird carcasses in the ponds will be promptly collected and buried.

Mobilization of Inorganic compounds and/or the Methylation of Mercury

Modified seasonal pond operations using muted tidal intake and discharge are not expected to result in wetting and drying conditions that result in a change in Redox potential. Inorganic compounds and methyl mercury levels were monitored during seasonal ponds operations from 2003-2006 and levels were not found to exceed WQOs, therefore further analysis is not anticipated. Management recommendations relevant to pond operations from the completion of the South Bay Mercury Study in Alviso may be incorporated into future operations plans.

Monitoring and Adaptive Management Action Plan

Monitoring Activities

Pond Management

Routine pond management requires weekly or monthly site visits to record pond conditions. The monitoring parameters are listed below.

Weekly Monitoring for Pond Management

Location	Parameter
Pond E10 (E11-1)	Pond Water Level, Salinity, Gate Settings
Pond E11 (E11-3)	Pond Salinity, Pond Water Level, Gate/Weir Settings

Water Quality

The Final Order requires water quality monitoring detailed in the Self-Monitoring Program. The summary below is relevant to summer discharge operations:

Pond Discharge Sampling: Continuous monitoring devices are not typically used for salinity, pH, temperature, and dissolved oxygen. Grab samples for salinity are regularly collected.

Receiving Water Sampling**:** Slough receiving water quality monitoring is not required. However, we report any adverse conditions observed during summer discharge to RWQCB and receiving water sampling is completed only when necessary to address outstanding concerns.

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Pond Management Sampling: Datasondes to collect pond water quality measurements were discontinued in 2006 due to limited applicability. Grab samples for pond management are collected regularly at the discharge and locations within ponds, as noted in the table above “Weekly/Monthly Monitoring Program for Pond Management”.

Chlorophyll-a sampling: Chlorophyll sampling ceased in 2005 due to limited applicability.

Annual Water Column Sampling for Metals: Water column samples collected from 2003 to 2005. Levels were within WQOs and therefore discontinued due to limited applicability.

Communication of Monitoring Results and Violations

Sufficient information is provided by grab samples and staff gauge observations, among other monitoring parameters, for pond management and operations. CDFW routinely reviews data and contacts RWQCB staff as needed to discuss pond management, operations and monitoring. We provide annual Self-Monitoring Reports that evaluate and discuss pond operations and management. CDFW provides all electronic data collected annually to RWQCB staff.

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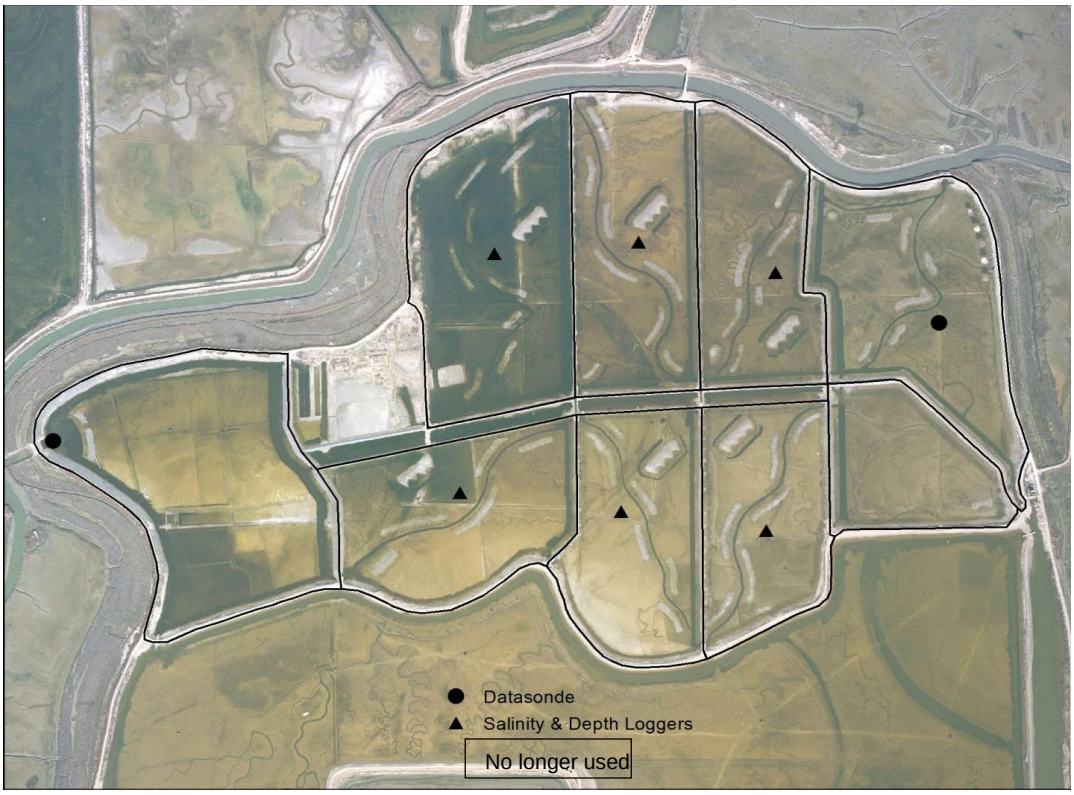
California Department of Fish and Wildlife
Eden Landing Ecological Reserve
Hayward, Alameda County
South Bay Salt Ponds
Operations Plan -- Pond System E12

Regional Water Quality Control Board
San Francisco Bay Region
Final Order Number: R2-2018-0020
(rescinded R2-2012-0014)



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January 2024

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Summary of Annual Operations Plan Conditions

No significant changes will be made in 2024 for operations in System E12. Ponds E12 and E13 were reconfigured and operational in 2015 as part of Phase 1 of the South Bay Salt Ponds Restoration Project (SBSPRP) actions. Ponds E12, E13, E14 and E8X are managed ponds.

Conditions observed in the spring and summer months reflect lower than average rainfall totals in March. Higher than typical salinity values were observed in managed ponds throughout 2022, likely due to drought conditions. Typical salinity values were observed in 2023. Moderate salinity values are maintained in summer with normal operations and sustained high discharge settings, keeping salinity generally below 44ppt. In-pond salinity averages since the 2012-2016 drought have been normal and we maintain continuous circulation during summer with low water levels.

Introduction

Reconfigured ponds E12 and E13 were designed as a “salinity experiment” with a series of shallow, open water cells of increasing salinity conditions (40 to 120ppt). Significant use by small and medium shorebirds occurs, as well as annual nesting by western snowy plover (WSP) and California least tern (CLT). Pond bottoms in E12 and E13 are maintained with shallow water and higher ground areas on islands and berms that are dry in summer.

System E12 ponds operate with continuous intake and discharge year-round. Pond E8X is operated as a forebay and as an intake and discharge mixing basin for pond E14. Pond E12 is the primary intake via Mt. Eden Creek (MEC) using the 2x48” Water Control Structure (WCS, E12-1). Discharge to Mt. Eden Creek and San Francisco Bay (SF Bay) occurs via a “Mixing Basin” in pond E13 with 5x36” WCS (E13MB) and is generally operated to maintain water quality objectives. Pond E14 is operated similarly to other seasonal ponds in ELER, with limited intake from tidal areas under continuous circulation, as needed, to support WSP and CLT nesting.

This Operations Plan describes the management activities expected to meet the goals and objectives for managed ponds at Eden Landing Ecological Reserve (ELER), owned and operated by California Department of Fish and Wildlife (CDFW). Pond operations are described in the South Bay Salt Ponds Initial Stewardship Plan, Phase One SBSPRP actions and the requirements of the Regional Water Quality Control Board’s (RWQCB) Final Order. A detailed description of System E12 as it is expected to be operated is discussed in the System Description section.

Summer and winter management activities are described in the Management section. Specific corrective measures that may be implemented to address water quality and manage the system are discussed in the Operations, Constraints, and Corrective Measures section.

Eden Landing Ecological Reserve (Baumberg Complex) Location

ELER, formerly called the Baumberg Complex and also referred to as Eden Landing, consists of a 6,400-acre complex of solar evaporator ponds along the eastern shores of San Francisco Bay in Hayward, Alameda County, and is owned and operated by CDFW. Prior to the 2003 acquisition from Cargill, all ponds within this complex were under Cargill ownership as part of their solar salt production pond system. The approach to the San Mateo Bridge (Highway 92) and the original 835-

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acre ELER, formerly known as the “Baumberg Tract,” forms the northern boundary of the complex. The site is bordered on the east by Old Alameda Creek, residential and commercial areas in the Cities of Hayward and Union City. Alameda Creek Flood Control Channel (aka Coyote Hills Slough) and other Alameda County property and the Coyote Hills Regional Park are near the southern boundary. San Francisco Bay borders the site to the west.

The main channels within ELER include Mount Eden Creek, North Creek and Old Alameda Creek. Alameda Creek Flood Control Channel is located on the southern perimeter of ELER. North Creek was restored to tidal action at Old Alameda Creek in April, 2005 and breached into the Eden Landing Ecological Reserve (Baumberg Tract) restoration site 1 miles upstream in October 2006. Mt. Eden Creek was restored to tidal action at the Bay in November 2006 and breached into the Eden Landing Ecological Reserve (Baumberg Tract) restoration site 2 miles upstream in October 2008. Several hundred acres of extant tidal marsh front the San Francisco Bay, known as the Whale’s Tail Marsh, are at the Bayfront near the center of the complex. This marsh is located outboard of former Ponds E9 and E8A, between Mount Eden Creek and Old Alameda Creek and along the western perimeter of Pond E1 and a portion of Pond E2.

System E12

System E12 is relatively small, approximately 387 acres and is composed of three main ponds and one smaller pond which acts as a mixing basin and intake forebay. Pond E14 will continue to be managed as a seasonal pond (dry in summer). The small portion of Pond E8X also remains a managed pond and operates as a forebay and mixing basin for Ponds E12 and E14. Table 1 describes the acreages and bottom elevations of the main ponds in System E12 and includes the ponds restored to full tidal action for reference. These Ponds are most easily accessed from the Eden Landing Road gate.

Table 1. Pond Size and Bottom Elevations

Pond	Area (acres)	Bottom Elevation (ft NAVD)
E12	99	5.5
E13	132	5.8
E14	156	5.5
E8X	5	3.0
Total/Average	389	5.6
Restored Ponds (Tidal)		
E9	356	4.6
E8A	256	6.0

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E8X	18	5.0
Total/Average	630	5.2

Biological Resources

Various waterbird species are known to use System E12, including small, medium and large shorebirds, wading birds such as avocets and stilts, and dabbling and diving ducks, depending on the season and pond water levels. Objectives of pond management and operations include providing suitable habitat for numerous waterbird species. Seasonal (dry in summer) managed ponds have open water generally from October through March. Shorebirds use shallower pond areas, while waterfowl and wading birds use deeper pond areas. Seasonal operations are likely to

provide suitable nesting habitat for Western snowy plover (WSP), a federally-listed Threatened species. The ponds are managed to have low salinity in the spring and allowed to draw down with evaporation such that salinity levels increase during the summer as the ponds dry.

The ponds of System E12 are characterized by salinities generally ranging from low (30-50 ppt) to medium (50-80ppt) with continuous circulation operation or as seasonal ponds. Reconfigured Ponds E12 and E13 have a series of cells in which low, medium and high salinity (80-120ppt) water flows by gravity into a mixing basin with low residence time and discharged to Mt. Eden Creek. Discharge from the E13 Mixing Basin may infrequently occur to Pond E14. The ponds are characterized by seasonal ponding approximately one foot deep for overwintering waterfowl with seasonal draw down to support foraging and roosting of migratory shorebirds. In the winter, this pond system typically supports abundant waterfowl including Northern shoveler, American Widgeon and Northern pintail, but diving ducks such as bufflehead, scaup, and ruddy duck have also been regularly observed. In addition, less common migrants such as Bonaparte's gull and eared grebe are known to use the ponds, particularly in the fall when ponds may be flooded and have higher salinities, depending on pond management and conditions. The largest concentration of nesting and over-wintering western snowy plovers are found in the area north of Alameda Creek, some of which are managed to provide suitable habitat for WSP. Seasonal pond E14 is annually used by WSP for nesting and foraging during the spring/summer, and shallower ponded areas are used during the winter. Higher salinity conditions provide high prey densities of brine shrimp, brine flies and reticulate water boatmen foraged by salt pond specialist species such as phalaropes and eared grebes.

Varying pond depths in this system result from limited intake and higher discharge volumes. During the spring and fall bird migration seasons, management operations would be transitioned according to seasonal use to provide optimum habitat conditions. These ponds may be heavily used by shorebirds for foraging, as is typical of shallower ponds. Shorebirds and other waterbirds may also use these ponds for roosting, particularly on the un-vegetated levees within the system and on remnant wooden structures. Tidally restored areas likely support fish populations in Ponds E9, E8A and E8X. No restrictions on intake are expected since salmonid entrainment is not anticipated, as Old Alameda Creek is not suitable spawning habitat due to the barrier to fish passage at the 20 Tide Gate crossing structure approximately 3 miles upstream from the mouth. North Creek and Mt. Eden Creek are limited to tidal marsh restoration areas and do not have upland watersheds and are also not suitable for salmonid spawning. Mt. Eden Creek was breached into the Eden Landing restoration site in October, 2008 and North Creek was previously breached into the Eden Landing restoration site in

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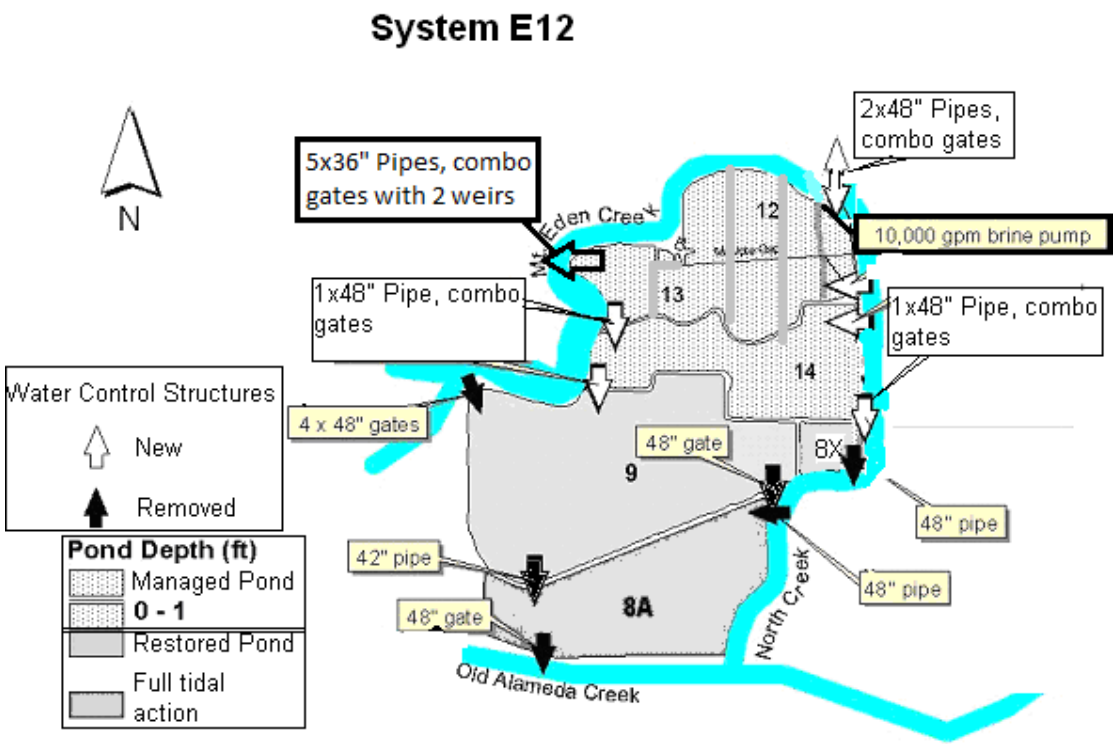
October, 2006. As vegetated tidal marsh develops, nursery habitat for fish may be provided. For a more complete discussion of these species and potential occurrence, see the Final EIR/EIS for the South Bay Salt Ponds Initial Stewardship Plan (April 2004) and SBSPRP (December, 2007).

System E12 Description

System E12 is approximately 387 acres including three main ponds, E12, E13 and E14. E14 is primarily managed as a seasonal pond (dry in summer) with intake/discharge from/to Mt. Eden Creek or North Creek. Reconfigured pond operations provide shallow, year-round open water in ponds E12 and E13. A portion of former Pond E8X remains a managed pond, operated as a forebay for intake to Pond E12 or as a mixing basin for flow from Ponds E14 and E12.

The objective of System E12 pond operations is to provide shallow, open water for shorebird foraging/roosting habitat in spring, shorebird nesting in summer, particularly for WSP, and shallow shorebird foraging/roosting habitat in the fall. Some areas in System E12 provide deeper open water habitat used by overwintering waterfowl. Summer operations are expected to maintain adequate water quality for continuous circulation and discharge, while maintaining adequate dry, panne habitat for nesting by WSP and other shorebird species. Higher salinity water is sufficiently mixed for discharge under continuous circulation operations. System E12 ponds provide a significant seasonal pond area within Eden Landing Ecological Reserve to support WSP nesting. Operations meet management goals and objectives for the SBSPRP, including Phase 1 and future actions. Applied studies will be conducted to provide information on pond ecology and inform pond management as part of Phase 1 and future SBSPRP actions. Habitat objectives for waterbirds are part of adaptive management and on-going operations.



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Objectives

- Full tidal action through Ponds E9, E8A and E8X via Mt. Eden Creek and North Creek
- Operate Ponds E12 and E13 as year-round, shallow water; E14 as a seasonal pond
- Manage shallow water depths for migratory shorebirds; manage large areas as mostly dry in late spring and summer to support WSP nesting and fledging; deeper water areas in winter for over-wintering waterfowl
- Maintain discharge salinity at or below 44 ppt
- Use gravity intake, pond to pond flow and discharge, with muted tidal intake/discharge to maintain target salinities. Pumped intake at E12 from Mt. Eden Creek as needed
- Operate Pond E8X as a forebay for E12 reservoir and as a mixing basin for E14

Water Control Structures

- 2 x 48” intake/discharge combo gates in Pond E12 at Mt. Eden Creek (E12-1).
- (24) weir pond-to-pond structures in E12-E13: (2) 48” open pipes; (1) 48” pipe with slide and flap gates; (4) 48” single weir; (6) 18” single weir; (11) 18” multi weir
- (5) 36” combo gates, two with weirs in E13 Mixing Basin (E13MB-WCS)
- (4) 18” pond-to-pond pipes with slide gates in E12-E13
- 1 x 48” intake/discharge combo gates in Pond E8X
- 1 x 48” intake/discharge combo gates in Ponds E14-E9 (E14-E9 new WCS)
- 1 x 48” pond-to-pond combo gates in Ponds E12-E8X
- 1 x 48” pond-to-pond combo gates in Ponds E14-E13
- 1 x 48” pond-to-pond combo gates in Ponds E14-E8X (E14-E8X new WCS)
- Existing staff gages in all ponds, new staff gages in each cell within E12-E13

Operations

Seasonal Ponds

Pond E14 is operated as a seasonal pond with shallow open water in the winter and mostly dry the in summer. Pond E14 may also have intake from the E8X forebay as well as from former pond E9. Because Pond E14 intake is limited, it is mostly dry during the summer. In 2014, habitat enhancements were completed in Pond E14 by spreading oyster shells at a low density over two

approximately 25-acre plots, or approximately one-half of the pond bottom. An additional ~3 acres of oyster shells were added in 2021 and 2022. E14 enhancements may improve nesting and fledging success for nesting western snowy plover (WSP). Seasonal pond E14 operations provide foraging, roosting and nesting habitat for shorebirds, in particular, WSP.

Reconfigured Ponds

Ponds E12 and E13 were reconfigured and have an intake reservoir, a central distribution canal, six cells (each pond with a series of three, flow-through cells) and a mixing basin. Ponds E12 and E13 are filled with intake from Mt. Eden Creek. A small portion of Pond E8X may act as a forebay for intake (the remainder of former pond E8X was restored to tidal action). Intake via pumping to E12 from Mt. Eden Creek is minimal. The typical bottom elevations in Ponds E12 and E13 limit passive intake to spring tide cycles, but deeper borrow ditch areas will retain water regularly, particularly where sheet drainage is blocked by existing pond topography.

Management Operations

Active management of the ponds is required, particularly for continuous circulation operations. Ponds E12 and E13 are fully operational, with shallow, progressively saline open water year- round. Pond E14 is typically shallowly flooded in September or October with gravity inflow via the existing water control structures (WCS) and augmented with rainfall. Pond E14 is managed as shallow, low salinity open water during the winter. Pond E8X is operated as a managed pond and is periodically used as a mixing basin as needed for Pond E14 discharge via North Creek.

Table 1. Pond Size, Bottom and Water Surface Elevations

Pond	Area (acres)	Average Bottom Elevation (ft NAVD)	Water Elevation (ft NAVD) varies*	
			Summer	Winter
8X	5	3.0	4.5	6.5*
12	99	5.5	6.0*	6.2*
13	132	5.8	6.0*	6.2*
14	156	5.5	5.0*	5.5*
Total/ Average	389	5.5	5.5*	6.0*

Summer Operation

May to October operations are intended to provide sufficient intake to maintain target salinity and water levels for shorebird foraging and roosting habitat and ensure adequate nesting and fledging habitat for WSP. Ponds will have muted tidal intake/discharge gate settings maintained as necessary to ensure low salinity discharge conditions under continuous circulation.

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Summer Gate Settings (*varies regularly, determined in field)

Gate	Setting (% open)
Pond E12 Intakes (E12-1)	2 x 100*
Pond E12 Discharge (E12-1)	0*
Pond E13 Intakes (E13MB - WCS)	5 x 100*
Pond E13 Discharge (E13MB – WCS)	Weir board height, 3 gates, 25% *
Pond E8X Intake	100*
Pond E8AX Discharge	50*
Pond E14 Intake, E8X – E14	10*
Pond E14 Discharge, E8X – E14	25*
Ponds E13-E14	25*
Pond E14 Intake, E9 – E14	25*
Pond E14 Discharge, E9 – E14	5*

Winter Operation

Winter operations are intended to provide continuous circulation flow to maintain deeper water level in Ponds E8X to support foraging and roosting for over-wintering waterfowl. Pond E14 is operated less than one foot deep to maintain migratory shorebird roosting and foraging habitat and minimize sedimentation of oyster shell enhancements described previously. Borrow ditches in E12 and E13 may be up to 3 feet deep. Winter water levels in System E12 are expected to be higher and salinity is typically “reset” to ambient salinity in SF Bay and sloughs, typically after the second large storm brings significant rainfall. High rainfall requires some active management, as System E12 will be operated as continuous circulation, shallow open water ponds. Pond water levels are controlled by adjusting intake and discharge gates as well as weirs, such that intake volumes would be equal to or greater than discharge volumes. Winter operations normally occur from November through April.

Winter Gate Settings (* varies, to be determined in field)

Gate	Setting (% open)
Pond E12 Intakes (E12-1)	2 x 100*
Pond E12 Discharge (E12-1)	Closed*
Pond E13 Intakes (E13MB - WCS)	5 x 100*

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Pond E13 Discharge (E13MB – WCS)	Weir board height, 3 gates, 25% *
Pond E8X Intake	100*
Pond E8AX Discharge	50*
Pond E14 Intake, E8X – E14	10*
Pond E14 Discharge, E9-E14	25*
Ponds E13-E14	5*
Pond E14 Intake, E9 – E14	10*
Pond E14 Discharge, E9 – E14	50*

Constraints and Corrective Measures

Constraints

The primary constraint in operating Pond E14 in summer is adequate intake and circulation to maintain target water levels and to maintain discharge salinity below 44 ppt (among other WQOs). Operation of Ponds E12 and E13 is adequate with gravity flow and the mixing basin in E13 to maintain target water levels and discharge salinity. Pumped intake into Pond E12 is minimal. With the exception of pond E8X, System E12 ponds have high bottom elevations which limit intake capacity during neap tide periods. Pond E14 operations maintain flow primarily in the borrow ditch, as the pond is seasonally dry (summer) and discharges to Ponds E8X or former pond E9. Reconfigured Ponds E12 and E13 maintain discharge salinity below 44ppt by regular flow in the mixing basin to moderate longer residence time in medium salinity (50-80ppt) and high salinity (80-120ppt) cells. Ponds E12 and E13 do not maintain target ranges in the winter. Pond E8X is operated deeper in winter, but maintains low salinity open water in summer. Pond E14 is maintained with shallow water in winter, primarily from rainfall and limited circulation operations.

No restrictions on intake are anticipated, as salmonid use of Mt. Eden Creek is limited to the tidally restored marshes with no upland connections. Salmonid entrainment is not expected. North Creek and Old Alameda Creek do not provide suitable spawning habitat and the latter has a barrier to fish passage at the 20 Tide Gate crossing structure approximately 3 miles upstream from the mouth. North Creek and Mt. Eden Creek are similarly not suitable for salmonids, as these creeks are sloughs limited to the tidally restored portions of ELER. Tidally restored areas here provide open water and marsh as nursery habitat.

Corrective Measures

Records are maintained on pond water levels, salinity grab samples and bird use. Tide levels and gate settings are noted and evaluated to determine optimum operations. The records are used to evaluate the effects of pond management activities on discharge and habitat objectives.

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Summer Water Level Control

To maintain target salinity ranges and water levels in System E12, active management is required during the summer. Pond water levels in System E12 are controlled by adjusting intake and discharge gates and weirs. Muted tidal operations result in minor fluctuations of water levels due to spring and neap tide periods. Water levels are more consistent in Ponds E12 and E13, while the mixing basin in Pond E13 and Ponds E8X and E14 fluctuate based on tidal conditions.

Salinity Control

Salinity is managed by muted tidal intake/discharge operations to ensure salinity remains below 44 ppt and is confirmed by regular pond monitoring. High salinity water within the borrow ditch of Pond E14 may be discharged to Pond E8X and be sufficiently mixed at the discharge to the tidal area portion of former Pond E8X. Winter pond operations ensure System E12 ponds have appropriate water and salinity levels at the start of the summer, regardless of rainfall totals.

Dissolved Oxygen (DO) Control

This pond system is operated with directional flow and open water in the winter and is expected to maintain adequate Dissolved Oxygen (DO) conditions at the beginning of the summer operations period. In the summer, operations maintain the ponds partially dry using muted tidal operations to ensure sufficient mixing for adequate DO discharge conditions. To maintain WQO's during the summer, inlet and outlet gate settings may be frequently adjusted to maintain lower water levels and ensure sufficient circulation. The objective of shorter residence time of pond water typically ensures low salinity is maintained. In some years, large algal mats form in summer and by fall are decomposing, which creates strong diurnal patterns of DO degradation and recovery. DO levels are expected to be adequate to protect receiving waters during continuous discharge. When using continuous data collection, a "trigger" for continuous circulation discharge reporting was included in the Final Order. The trigger value is when the weekly 10^{th} percentile value falls below 3.3 mg/L, when using a continuous monitoring device. When DO levels at the pond discharge fall below the trigger value, Best Management Practices (BMPs) listed in this Operations Plan may be used, including additional monitoring, adjusting intake or discharge settings, or temporarily suspending discharge. Timely notification to RWQCB will be made if substantial, adverse conditions are observed.

BMPs include the reducing or closing the discharge during short periods of time when sustained low DO is observed or expected. Discharge settings are typically adjusted weekly. Daily discharge timing is not practicable due to staff and budget constraints. Reducing or closing the discharge for a period of days during neap tide periods is limited. Limited intake and circulation/mixing appears to prolong residence time of pond water may not improve DO levels. Therefore maintaining discharge even at reduced volumes allows increased volume of intake and promotes mixing and circulation. This would reduce the duration of time that pond water would be expected to have lower DO conditions. A larger daily volume of water enters the receiving waters, but likely minimizes the duration of low DO potentially affecting receiving waters and may also reduce the period of low DO values in ponds.

Dissolved Oxygen BMPs

As noted above, BMPs have been developed, implemented and evaluated to reduce potential impacts to receiving waters. These BMPs are discussed below:

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1. Slough Monitoring

Additional data may be collected to determine if ambient slough conditions meet water quality objectives and if the receiving waters are potentially affected by low DO pond discharge.

2. Adjust Discharge Flow

Discharge may be decreased to reduce the potential effects in receiving waters. Decreasing discharge may immediately minimize low DO entering receiving waters. However, it may prolong the period in which pond water may be subject to low DO conditions since intake is more limited with higher water surface elevation during neap tides. Increased discharge volumes promote intake and mixing during strong (spring) tide periods to improve pond water quality.

3. Monthly Discharge Timing

Water control structures have significant discharge capacity. Discharge is typically greater than 25% open to maintain the extent of shallow water and dry pond bottom area. Discharge gates may be set at higher volumes during periods with low tides during the day, when DO is expected to be higher due to algal photosynthesis. When low tides are at night, during those periods gate settings could reduce the volume of discharge when pond DO levels may be lower than ambient.

4. Drain Seasonal Ponds into Continuous Circulation Pond

Seasonal pond E14 may be periodically drained into the adjacent continuous circulation pond E8X to turnover seasonal pond water, where after the seasonal ponds may be refilled with slough water or intake from the continuous circulation pond.

5. Weekly Discharge Timing

If DO levels are low for a given week, particularly during neap tides, discharge gates are adjusted approximately weekly to reduce discharge when low tides are at night. Increased discharge occurs when higher tides are at night and discharge occurs mostly during the day when pond DO levels are higher. During summer, DO may be higher from approximately 10 a.m. to 10

p.m. Daily discharge timing is not practicable due to limited staff availability. Increased discharge settings may briefly increase salinity near the discharge in receiving waters, but is not expected to exceed 44 ppt for extended periods as the volume is very small compared to sloughs.

6. Temporarily Cease Discharge

Temporarily ceasing discharge may prevent low DO conditions locally in receiving waters. However, periods without circulation within ponds could prolong adverse water quality conditions in the pond or could result in poorer conditions, depending on weather and other factors. Stagnating water could also have an adverse effects on the biological resources in the ponds. Long periods of suspended discharge could also create substantial odor as accumulated biomass is exposed and decays, affecting sensitive individuals in the neighboring communities. Discharge may be ceased only for short periods (days), such as when salinity is above 44ppt during neap tide periods. Discharge would

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resume as soon as possible to adequately mix pond water and improve water quality at the discharge, particularly during spring tide periods.

7. Installation of Baffles

A series of flow diversion baffles installed at the pond discharge to direct the water from more suitable DO waters to achieve maximum oxygen uptake requires frequent maintenance and has been observed to have little affect on pond waters at the discharge. Baffle use is not expected.

8. Mechanically harvest dead algae.

Dead algae may be removed by hand when accumulating at the discharge. If extensive mats are noted in the pond, mechanically harvesting dead algae on a pond wide basis is not practicable.

9. Aeration

Aeration would require installation of bubbler/diffuser systems or floating mechanical aerators near the discharge. Aerators were evaluated by U.S. Fish and Wildlife Service at Alviso ponds in 2005 and were not effective. This BMP is not expected to be implemented.

pH Control

Pond water pH may be related to DO; however, past evaluation of continuous data did not show direct correlation. High pH (and low DO) appears due to poor circulation and warm temperatures and other abiotic and biotic factors. Past analysis showed pH values generally ranged 6.5 to 8.5, but in stagnant areas pH approaches 9.0 or greater. Stagnant waters are usually only found far from discharge locations; therefore, sampling for ammonia in receiving waters has shown little basis for action in previous analysis. Corrective measures above can be used as needed.

Avian Botulism Control

Avian botulism has not been observed in ELER, and is not expected to occur in typically saline conditions at ELER. To reduce the likelihood of a severe outbreak of this disease, dead bird carcasses observed in the ponds will be promptly collected and buried.

Mobilization of Inorganics and/or the Methylation of Mercury

Operation of Pond E8X includes constant flooding conditions. No change in Redox potential is expected and is not expected to result in methylation of mercury. Seasonal operations in Pond E14 minimizes the extent to which the ponds are subjected to repeated wetting and drying conditions. Inorganics and methyl mercury levels were monitored from 2003-2006 in seasonal ponds and levels were not found to exceed WQOs. No further analysis is anticipated.

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Monitoring and Adaptive Management Action Plan

Pond Management Monitoring

Routine pond management requires weekly or monthly site visits to record pond conditions. The monitoring parameters are listed below. Visual inspections are conducted to locate potentially adverse conditions, as well as inspections of water control structures, levees, etc.

Weekly Monitoring Program for Pond Management

Location	Parameter
Pond E12 Intake Reservoir at WCS/Pump Location	Depth, Salinity, DO, pH, Temp, Observations
Pond E13 Mixing Basin intake/discharge	Depth, Salinity, DO, pH, Temp, Observations
Ponds E12 & E13 (Low, Medium and High Salinity Cells)	Depth, Salinity, Observations
Pond E12 Intake Reservoir at E8X WCS Location	Depth, Salinity, Observations
Pond E8X at E8X-Tidal WCS	Depth, Salinity, Observations
Pond E14 at E9-Tidal WCS	Depth, Salinity, Observations
Pond E14 at E14-E8X WCS	Depth, Salinity, Observations

Water Quality

The Final Order requires water quality monitoring detailed in the Self-Monitoring Program. The summary below is relevant to summer discharge operations:

Pond Discharge Sampling: Continuous monitoring devices (Datasondes) are not typically used for salinity, pH, temperature, and dissolved oxygen. Grab samples for salinity are regularly collected.

Receiving Water Sampling**:** Slough receiving water quality monitoring is not required. However, we report any adverse conditions observed during summer discharge to RWQCB, and receiving water sampling is completed only when necessary to address outstanding concerns.

Pond Management Sampling: Datasondes to collect pond water quality measurements were discontinued in 2006 due to limited applicability. Grab samples for pond management are collected regularly at the discharge and locations within ponds, as noted in the table above “Weekly/Monthly Monitoring Program for Pond Management”.

Chlorophyll-a sampling: Chlorophyll sampling ceased in 2005 due to limited applicability.

Annual Water Column Sampling for Metals: Water column samples collected from 2003 to 2005. Levels were within WQOs and therefore discontinued due to limited applicability.

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Communications of Monitoring Results and Violations

Sufficient information is provided by grab samples and staff gauge observations, among other monitoring parameters, for pond management and operations. CDFW routinely reviews data and contacts RWQCB staff as needed to discuss pond management, operations and monitoring. We provide annual Self-Monitoring Reports that evaluate and discuss pond operations and management. CDFW provides all electronic data collected annually to RWQCB staff.

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California Department of Fish and Wildlife
Eden Landing Ecological Reserve
Hayward, Alameda County
South Bay Salt Ponds
Operations Plan -- Pond System E2 and E2C

Regional Water Quality Control Board
San Francisco Bay Region
Final Order Number: R2-2018-0020
(rescinded R2-2012-0014)

Prepared by:

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Summary of Annual Operations Plan Conditions

Typical operations are expected. No substantial changes are proposed in System E2-2C for 2024. The California Department of Fish & Wildlife (CDFW) will operate System E2/2C in Eden Landing Ecological Reserve (ELER) similar to previous years. Ponds E5, E6 and E6C are expected to be operated as drawn down “batch” ponds with higher salinity than other ponds in the system. Pond E6C may be partly dry as a seasonal pond area for western snowy plover (WSP) breeding habitat. System E2/2C normally allows increased discharge operations.

Conditions observed in the spring and summer months reflect lower than average rainfall totals in March. Higher than typical salinity values were observed in managed ponds throughout 2022, likely due to drought conditions. Typical salinity values were observed throughout 2023. Moderate salinity values are maintained in summer with normal operations and sustained high discharge settings, keeping salinity generally below 44ppt. In-pond salinity averages since the 2012-2016 drought have been normal and we maintain continuous circulation during summer with low water levels.

Introduction

This Operations Plan describes pond management activities used to meet goals and objectives for managed ponds at Eden Landing Ecological Reserve (ELER), owned and operated by the California Department of Fish and Wildlife (CDFW). Pond operations are also described in the South Bay Salt Ponds (SBSP) Initial Stewardship Plan, Phase One SBSP Restoration Project actions and the Regional Water Quality Control Board’s (RWQCB) Final Order. Detailed descriptions of operations in Systems E2 and E2C are in the System Description section, summer and winter management activities are in the Management section, and the specific corrective measures are in the Operations, Constraints, and Corrective Measures section. Existing water control structures (WCS) primarily include 48” culverts with combination slide/flap tide gates that allow the ponds to be operated passively under muted tidal conditions, or be operated in series with more directional, continuous circulation.

Eden Landing Ecological Reserve (Baumberg Complex) Location

ELER, formerly called the Baumberg Complex and also referred to as Eden Landing, consists of a 6,400-acre complex of solar evaporator ponds along the eastern shores of San Francisco Bay in Hayward, Alameda County, and is owned and operated by CDFW. Prior to the 2003 acquisition from Cargill, all ponds within this complex were under Cargill ownership as part of their solar salt production pond system. The approach to the San Mateo Bridge (Highway 92) and the original 835-acre ELER, formerly known as the “Baumberg Tract,” forms the northern boundary of the complex. The site is bordered on the east by Old Alameda Creek, residential and commercial areas in the Cities of Hayward and Union City. Alameda Creek Flood Control Channel (aka Coyote Hills Slough) and other Alameda County property and the Coyote Hills Regional Park are near the southern boundary. San Francisco Bay borders the site to the west.

The main channels within ELER include Mount Eden Creek, North Creek and Old Alameda Creek. Alameda Creek Flood Control Channel is located on the southern perimeter of ELER. North Creek was restored to tidal action at Old Alameda Creek in April, 2005 and breached into the Eden Landing Ecological Reserve (Baumberg Tract) restoration site 1 miles upstream in October 2006. Mt. Eden

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Creek was restored to tidal action at the Bay in November 2006 and breached into the Eden Landing Ecological Reserve (Baumberg Tract) restoration site 2 miles upstream in October 2008. Several hundred acres of extant tidal marsh front the San Francisco Bay, known as the Whale's Tail Marsh, are at the Bayfront near the center of the complex. This marsh is located outboard of former Ponds E9 and E8A, between Mount Eden Creek and Old Alameda Creek and along the western perimeter of Pond E1 and a portion of Pond E2.

Pond Systems E2 and E2C

Pond System E2 is relatively large, totaling 1,394 acres. It includes Ponds E1 (337 acres), E2 (673 acres), E4 (175 acres) and E7 (209 acres) and is located on the south portion of ELER, between OAC and Alameda Creek FCC. The average bottom elevation of these ponds is 2.3-feet (NGVD). These ponds are most easily accessed from the Veasy Street Gate.

Pond system E2C is relatively large, 942 acres in size. It includes Ponds E6 (176 acres), E5 (159 acres), E6C (78 acres), E4C (175 acres), E1C (66 acres), E5C (111 acres) and E2C (24 acres).

Cargill Pond (CP) 3C (153 acres) was not acquired by CDFW in 2003; however, CP 3C remains hydrologically linked to ELER Pond E2C ponds and is operated as part of System E2C. These ponds are located along the southern and eastern boundary of the ELER adjacent to Alameda County Flood Control District (ACFCD) lands comprised of diked marshes used as detention basins and ponding areas and CP 3C. Pond bottom elevations range from 2.4 to 3.6 NGVD. These ponds are most easily accessed from the gate at Westport Rd. and the Alameda Creek Regional Trail. CP3C may be acquired from Cargill by CDFW or others in the future.

Ponds E6, E5 and E6C are generally operated as part of the Pond E2 System. Ponds E6C, E6 and E5 are typically managed "batch" ponds (salinity to ~120ppt) with year-round open water. The ponds have low salinity in the spring, are allowed to increase salinity during the summer, with "make-up" water flow from Ponds E7 and E4 to maintain target water levels. The high salinity water in Ponds E6C, E6 and E5 is recirculated during the winter through the entire system and discharged. Continuous circulation normally reduces the salinity for the next summer season. For 2024 operations, Ponds E6 and E5 will be managed as batch ponds and E6C may be drawn down to dry seasonal pond area for WSP breeding habitat. Ponds E5C, E4C and E1C will be seasonally dry, with periodic, managed inflow via Pond E2C. Ponds E4C, E5C and E1C are operated in winter as open water, with shallow water conditions in the fall and spring and are mostly dry during the summer. Pond E1C was a supplemental intake pond under Cargill Salt operations using water pumped from Alameda Creek FCC. The pump is no longer operable. Ponds E4C, E5C and E1C do not maintain open water during the summer, and pumped intake operations will not be resumed. Constraints on pumping include high maintenance and energy costs, and elevated salinity resulting from high summer evaporation that precludes adequate circulation and mixing prior to discharge. Ponds E1C, E5C and E4C are generally filled from E2C in late- October with and increased gravity inflow and the onset of rainfall.

Biological Resources

Biological resource information for the Pond E2 and the E2C Systems are described separately because species use of the ponds in each of the systems reflect different habitats and pond water

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levels. Seasonal ponds in System 2C may be used by western snowy plover (WSP) for nesting and foraging during the spring/summer, and shallower ponded areas may be used by WSP during the winter, though substantially less than ponds north of OAC. Ponds E1, E2, E7, E4 and E2C and CP 3C are circulation ponds. Ponds E6, E5, E6C and Ponds E5C, E4C and E1C are seasonal ponds, mostly dry in summer. Ponds E1, E2, E4, E7 and E2C and E3C have small islands and pond bottoms in each pond remain inundated. CP 3C's bottom is generally open water, while E2C's bottom may be periodically exposed during neap tides, though it remains wetted.

Biological Resources- System E2

System E2 ponds support migratory and resident avian species. Pond management and operations vary according to season. The ponds of this system are characterized by low salinities and pond depths of a foot or more. This pond system typically supports over-wintering waterfowl, including dabbling ducks, such as American widgeon, northern pintail and northern shoveler, and diving ducks such as bufflehead, scaup, and ruddy duck. The ponds also support piscivorous birds, both resident and migratory, including double crested cormorant, gulls, white and California brown pelican, and least, Forster's, and Caspian terns.

Given pond depths, the ponds are generally used by shorebirds only along shallower margins, relict wooden structures and other shallow or exposed portions of ponds in the system. Wading shorebirds such as black-necked stilt and American avocet as well as Forster's terns may use small linear islands found in the ponds as nesting areas. Shorebirds and other waterbirds, including Canada goose, primarily use these ponds and levees within the system for roosting.

Pond E1 is the primary intake pond. Pond E2 is the primary discharge location. System E2 ponds support fish populations, except in batch ponds. For a more complete discussion of these species and potential occurrence, see the Final EIR/EIS for the South Bay Salt Ponds Initial Stewardship Plan (April 2004) and the SBSPRP (December, 2007).

Biological Resources- System E2C

System E2C ponds support migratory and resident waterbirds. Pond management and operations vary according to season. Ponds E2C and CP 3C are managed to have low salinity, year-round shallow water. Ponds E5C, E4C and 1C are seasonal ponds with winter open water, shallow water conditions in the fall and spring transitional periods and are mostly dry in the summer.

Ponds E4C, E5C and E1C do not circulate in summer, and shallow water conditions during the summer with high evaporation rates would result in poor conditions that don't meet water quality objectives. The Cal Hill Intake Pump is no longer operable. Ponds E4C, E5C and E1C will not have flow to maintain open water during the summer. Ponds E1C, E5C and E4C are generally filled from E2C in late-October, when evaporation rates lower and fall season migratory waterbirds have arrived. With rainfall and increased circulation via gravity inflow, all ponds are managed in circulation in winter to support over-wintering waterfowl and migratory shorebirds.

High use by shorebirds is observed in System 2C ponds during the spring and fall migrations. Pond management and operations target shallow water depths, similar to other shallow managed ponds. Small- to medium- sized shorebirds in particular are observed using shallow water and exposed pond bottoms for foraging when outboard bay mudflats are inundated. CDFW's optimum habitat conditions vary according to seasonal use patterns. Migratory small, medium and large shorebirds, resident

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wading birds (avocets, stilts) and overwintering dabbling ducks (Northern shoveler and pintail) as well as diving ducks (ruddy duck and bufflehead) are common. The seasonal ponds in System E2C may be used by WSP for nesting and foraging during the spring/summer, and shallower pond areas may be used by WSP during the winter. Higher salinity conditions in seasonal ponds provide high prey densities of brine shrimp, brine flies and reticulate water boatmen, which provide important prey for species such as phalaropes and eared grebes, among others. Canada goose and California gull also roost and forage here.

Pond E2C and CP 3C may support fish populations, but piscivorous birds such as Forster's terns are not regularly observed foraging or roosting. Restricting intake during the winter to prevent entrainment of salmonids such as steelhead trout may be required once other (non-SBSPRP) restoration actions such as barrier removal and a fish ladder upstream in Alameda Creek Flood Control Channel are completed. Restricting intake (to spring though fall) limits the ability to maintain operational salinities and suitable habitat conditions for waterbirds and as suitable for fish. For a discussion of these species and potential occurrence, see the Final EIR/EIS for the SBSP Initial Stewardship Plan (April 2004) and SBSPRP (December, 2007).

System Description

Ponds are managed according to season and waterbird use, ranging from deeper ponded water for overwintering waterfowl to shallow water levels during the spring and fall for waterbird migration seasons, with some dry pond areas for breeding habitat in summer for resident waterbirds. By varying operations, pond depths in this system are optimized for various species. Water levels in the summer are limited by evaporation and tidal conditions with respect to intake and high surface to volume ratios. System E2 and E2C operate independently under summer operations. There is insufficient "head" pressure to move water through the siphon that connects Ponds E6C and E5C, previously used to couple the two systems for salt production by Cargill.

Ponds E1, E7, E4 and E2 operate as one circulation system and allow seasonal recirculation of Ponds E6C, E6 and E5, which are typically higher salinity "batch" or seasonal ponds. Pond E2C and CP 3C are operated with continuous circulation, and ponds E5C, E4C and E1C are seasonal.

Pond E2 System

An existing intake pump from lower Old Alameda Creek previously used by Cargill is no longer operable. Pond E1 is the primary intake with a 4x48" water control structure (WCS) for gravity inflow. The E1 WCS has two open pipes and two slide gates, with two flap gates to allow for inflow at all four culverts. Discharge could occur at two culverts with combo gates, but typical operations do not discharge from E1. During the winter, the inflow from Pond E1 circulates through Ponds E7, E6, E5 and E4 to the discharge at Pond E2. In the summer, Pond E7 and E4 are allowed to draw down, because the primary flow is from Pond E1 to E2. The Pond E2 discharge location includes combination gates for intake and discharge through both culverts, operated as muted tidal, with varied settings as needed.

Ponds E6 and E6C are managed as seasonal, high salinity "batch" ponds or are allowed to draw down as seasonal ponds. Typically, Ponds E6 and E5 are managed as batch ponds with year- round water. The ponds have low salinity in the spring and summer evaporation increases salinity. Winter operations circulate the batch ponds into subsequent ponds to reduce salinity.

Pond E2C System

Pond E2C has a single intake/discharge structure from/to Alameda Creek FCC (E2C-14). The structure includes two 48” culverts with two combination gates on each side, to allow both intake and discharge. Pond E2C and CP 3C are operated as year-round open-water ponds. Pond E1C has a separate intake pump (Cal Hill Pump) but it is no longer operable. Pumped intake will not be used because of high maintenance and energy costs.

Ponds E4C, E5C and E1C are operated as seasonal ponds, with open water maintained only during the winter, are draw down in spring, are mostly dry during the summer, and shallowly reflooded in the fall for seasonal use by migratory shorebirds. Pond E5C does not have inflow from Pond E2C in summer, as this BMP may result in high salinity shallow water as noted above. Ponds E1C, E5C and E4C are generally filled from E2C in October and winter rain.

Due to the constraints noted above and because of fairly high pond bottoms, intake and discharge is limited to passive flow. Ponds E1C, E4C and E5C are mostly dry during the summer. Muted tidal operations in E2C are suitable for maintaining low salinity discharge (below 44 ppt). The ponds of this system are characterized by salinities ranging from low (20-40 ppt) to medium (40- 80 ppt). Ponds E5C, E4C and E1C are operated as open water ponds in winter approximately 1-2 feet deep to support overwintering waterfowl. In the spring and fall, Ponds E5C, E4C and E1C have shallower water (0-6”) which supports migratory shorebirds.

System Map

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Objectives

- System E2 and E2C operations to maintain year-round open water habitat of various depths in Ponds E1, E2, E7, E4 and E5 and E2C and deeper open water habitat in winter in all E2 and E2C System ponds. Muted tidal circulation occurs via Ponds E2 and E2C.
- Maintain discharge salinity into SF Bay (Pond E2) and Alameda Creek FCC (Pond E2C) at less than 44 parts per thousand (ppt) via muted tidal circulation in Ponds E2 and E2C.
- Operate Cargill Pond (CP) 3C as part of E2C system as year-round open water.
- Manage for different waterbird guilds in summer vs. winter by varying depth and salinity
- Maintain prey base for overwintering ducks, migratory shorebirds and resident waterbirds

Water Control Structures

- Four 48” culverts (intake: two open pipes, two slide gates; discharge: two 48” combo gates, two flap gates) near the northwest end of Pond E1 from Old Alameda Creek, near the San Francisco Bay. Generally operated as intake only. (E2-1)
- 10,000 gpm pump (#1 Baumberg Intake) from Old Alameda Creek (not operable)
- One 48” culvert with a slide gate from Pond E1 to E2 (E2-3)
- Two 40-foot levee gaps from Pond E2 to E4 (remaining E2-E4 levee deteriorated)
- Two 48” intake/discharge gates at the bayfront (western) levee of Pond E2 at SF Bay (E2-10)
- One 48” culvert with a slide gate from Pond E1 to E7 (E2-5)
- One 48” culvert with a slide gate from Pond E7 to E4 (E2-7)
- One 48” culvert with a slide gate from Pond E7 to E6 (E2C-2, currently not operable)
- One 48” culvert with a combo gates at Pond E4 to E5 (E2C-7)
- Two 36” culverts with combo gates from Pond E5 to E6C (E2C-4 and E2C-5)
- Two 30” siphons from Pond E6C to E4C (B2C-8) (not operable, flows w/sufficient head pressure)
- One 40-foot levee gap from Pond E4C to E5C
- One 36” culvert with combo gate from Pond E2C to E5C (E2C-15)
- One 48” culvert with a slide gate from Pond E2C to CP 3C (E2C-12)

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- One 40-foot levee gap from Pond E1C to E5C
- One 7660 gpm pump (Cal Hill Intake) from Alameda FCC to Pond E1C (not operable)
- One 10000 gpm pump (Cal Hill Transfer) from Pond E2C to CP 1A (not operable)
- Two 48” intake/discharge culverts with combo gates, Pond E2C to Alameda Creek FCC (E2C-14)
- Existing staff gages in all ponds except Pond E4C

Management Operations

Records of salinity, water levels and gate settings are maintained. Tide levels, weather and slough conditions and waterbird use are also evaluated to determine whether ponds operations are achieving management objectives. Annual conditions vary and affect operations. Systems E2 and E2C operate at lower water levels during summer (May to October) to increase intake and discharge and maintain target salinity range and water levels.

Summer Operation

For system E2, summer operations provide circulation flow through Ponds E1 and E2. The daily average total circulation inflow is approximately 55 cubic feet per second (cfs), or 110 acre-feet per day, with an outlet flow of about 45 cfs (90 acre-feet/day) under modeled conditions. The intake gates at Pond E2 are open to allow muted tidal inflow. The total inflow of approximately 110 acre-feet per day includes 65 acre-feet per day inflow at Pond E1 and 45 acre-feet per day inflow at Pond E2. “Make up” water is provided from Ponds E1, E7 and E4 to Ponds E6, E5 and/or E6C, to replace water lost to evaporation during the summer season (approximately 20 acre-feet/day).

Ponds E6 and E5 are operated as seasonal ponds and allowed to draw down and maintain shallow open water as higher salinity “batch” ponds (40-120 ppt) with little circulation outflow during the summer. Pond E7 primarily provides water to Ponds E6 and E5 to make up for evaporation during the summer. Pond E6C is operated as a seasonal or batch pond, as needed Pond E6C management is similar to Ponds E6 and E5 under batch pond operations. Lower salinity in shallow ponds during the spring helps maintains lower salinity overall, but may contribute to algal growth and affect DO levels in summer.

For system E2C, summer operations provide circulation flow to and from Ponds E2C and CP 3C. Ponds E5C, E4C and E1C are operated as seasonal ponds. The estimated circulation flow at Pond E2C is 26 cfs (daily average) or 52 acre-feet/day. Pond E2C operates with muted tidal circulation at the intake/discharge WCS at Alameda Creek FCC. Muted tidal intake and discharge volumes are typically less than 25 percent of pipe capacity in Ponds E2C. Active management is required to maintain salinity conditions under 44 ppt as described below.

Ponds E1C, E4C and E5C are seasonal ponds, allowed to draw down and mostly dry during the summer. Ponds E1C, E4C and E5C are not regularly flooded by flows from Pond E2C during the spring through fall to provide suitable foraging habitat for migrating shorebirds. These ponds may

have increased salinity due to the high surface area and shallow water. Seasonal ponds are generally diluted prior to discharge via mixing in Pond E2C. The Cal Hill Intake pump previously used by Cargill for salt production ponds is no longer operable. The pump station platform has deteriorated and is not safe to operate nor is expected to be repaired. Long-term restoration planning for System E2/2C is part of Phase Two of the SBSPRP.

Summer Pond Water Levels (* = varies, depending on conditions)

Pond	**Area (Acres)**	**Bottom Elev. (ft, NGVD)**	**Water Level (ft, NGVD)**	**Water Level (ft, Staff Gage)**
System E2				
E1	337	2.2	3.4	3.4
E7	209	2.5	3.1*	3.4
E4	175	2.9	3.1	3.1
E2	673	2.1	3.1	3.1
E6	176	2.4	3.0*	3.0
E5	159	2.4	3.0*	3.0
E6C	78	2.8	3.0*	3.0
System E2C				
E4C	175	3.2	-	-
E1C	66	3.6	-	-
E5C	111	3.4	3.3*	<3.6*
CP 3C	153	2.9	3.3	3.6
E2C	24	2.7	3.3	3.3

Summer Gate Settings *determined in the field

Gate	**Setting* (% open)**
Pond E1 intake (E2-1)	100 (4x48”)
Pond E1 discharge (E2-1)	0* (1x48”)
Pond E1 to E7 (E2-5)	0*
Pond E1 to E2 (E2-3)	100

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Pond E7 to E6 (E2C-2)	0*
Pond E6 to E5 (E2C-3)	25* (not operable)
Pond E5 to E6C (E2C-4)	0*
Pond E6C to E4C siphon (E2C-8)	(not operable, flows w/sufficient head)
Pond E2 intake (E2-10)	100 (2 gates)
Pond E2 discharge (E2-10)	25* (1-2 gates)*
Pond E5C to E4C gap (E2C-10)	n/a
Pond E2C to E5C (E2C-15)	25* (not operable)
Pond E2C inlet (E2C-14)	50* (2 gates)*
Pond E2C outlet (E2C-14)	<25* (1 gate)

The System E2 summer gate settings are based on observed conditions during previous operations and previous pond modeling, assuming average evaporation conditions. Gate settings are adjusted as needed to limit summer salinity increases and maintain continuous circulation conditions described in the Final Order, considering Water Quality Objectives (WQOs) and pond management objectives. The pond operations are adjusted to account for field conditions.

Winter Operation

Winter operations have continuous circulation in both systems. Evaporation is normally minimal and the ponds have higher water levels, consequently there is less inflow and outflow is reduced at the discharge. Periodic, large inflows occur as a result of storm surge during high tide periods. Rainfall input, intake and circulation in the larger open water area significantly reduces salinity. In wet years, SF Bay salinity may be below 15 ppt for long periods.

For System E2, at winter operational water levels, the estimated average total winter circulation inflow is approximately 8 cfs (daily average), or 16 acre-feet per day, with an outlet flow of about 10 cfs (20 acre-feet per day). The winter operation period is normally November through April. Typically beginning in October, circulation from Pond E1 is diverted to Pond E7 (vs. E2) to begin circulation through Ponds E6 and E5 (and E6C) to reduce salinity in those ponds.

Higher salinity “batch” water in Ponds E6 and E5 (and E6C) is recirculated and mixed sufficiently into E4 and discharged via E2 during winter. Continuous circulation with lower volume discharge maintains higher water levels (4.5 feet NGVD). Operations vary to maintain appropriate water levels and/or salinity in the system.

For System E2C, the estimated average total winter circulation inflow is approximately 2 cfs (daily average), or 4 acre-feet per day, with an outlet flow of about 4 cfs (8 acre-feet per day).

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Winter operations are normally November through April. The gate settings are maintained for extended periods, but vary as needed to target water levels, primarily by adjusting the discharge. Reduced intake may be needed during prolonged storm surge events. Beginning in October, the water level in pond E2C is raised to allow circulation through Ponds E5C, E4C and E1C. Water surface elevation is maintained at approximately 4.2 feet NGVD in winter.

Winter Pond Water Levels

Pond	Area (Acres)	Bottom Elev. (ft, NGVD)	Water Level (ft, NGVD)	Water Level (ft, Staff Gage)
E1	337	2.2	4.2	4.2
E7	209	2.5	4.2	4.4
E4	175	2.9	4.2	4.5
E2	673	2.1	4.2	4.2
E6	176	2.4	4.2	4.2
E5	159	2.4	4.2	4.2
E6C	78	2.8	4.2	4.2
E4C	175	3.2	4.2	-
E1C	66	3.6	4.2	4.2
E5C	111	3.4	4.2	4.4
CP 3C	153	2.9	4.2	4.5
E2C	24	2.7	4.2	4.2

Winter Gate Settings* Determined in the field

Gate	Setting* (% open)
Pond E1 intake (E2-1)	100* (4 x48”)
Pond E1 discharge (E2-1)	0 (2 gates)
Pond E1 to E7 (E2-5)	100
Pond E1 to E2 (E2-3)	100
Pond E7 to E6 (E2C-2)	100*
Pond E6 to E5 (E2C-3)	100 (1-2 gates)

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Pond E5 to E6C (E2C-4)	100*
Pond E6C to E4C (E2C-8)	(not operable)
Pond E2 intake (E2-10)	0-100* (2 gates*)
Pond E2 discharge (E2-10)	25* (1-2 gates)
Pond E5C to E4C (E2C-10)	(Levee gap)
Pond E2C to E5C (E2C-15)	50* (not operable)
Pond E2C inlet (E2C-14)	100* (2x48”)
Pond E2C outlet (E2C-14)	5-25* (1-2x48”)

Constraints and Corrective Measures

Constraints

The primary constraint in operating this system is the ability to adequately circulate water in the ponds in the summer to maintain low salinity discharges which meet WQOs. Circulation is necessary to maintain suitable foraging, roosting and nesting habitat for shorebirds and to support benthic invertebrate populations through the summer. Summer operations use muted tidal intake/discharge at the outlet to maintain appropriate depth and salinity with periodic adjustment to ensure sufficient mixing and continuous circulation below 44 ppt.

Corrective Measures

Records are maintained on pond water levels, salinity grab samples and bird use. Tide levels and gate settings are noted and evaluated to determine optimum operations. The records are used to evaluate the effects of pond management activities on discharge and habitat objectives.

Summer Water Level Control

Ponds E2 and E2C require active management in summer. Neap tide periods and adjustment of discharge gates most affect water levels in Ponds E2 and E2C, which affects the flow in other ponds in Systems E2 and E2C. The internal (pond-to-pond) gates affect circulation from Ponds E1 to E7, Ponds E7 to E4, and Ponds E1 to E2. Routine operations have intake gates fully open and one to two discharge gates at Ponds E2 and E2C set at approximately 25% open. Because the normal water level in the pond is above mean water level in the Bay, the outlet gate will discharge for more hours of the day than the duration of intake. Water levels in ponds do not vary daily, but may vary by 0.5 feet over weeks to months due to spring and neap tides and weather conditions. Low water levels in some system ponds may expose pond bottoms.

Summer pond water levels in Ponds E1 and E2 under continuous circulation generally maintains discharge salinity below 44 ppt. CDFW operations since 2005 maintain summer pond water levels in Pond E1 at approximately 3.4 feet and Pond E2 at approximately 3.1 feet (NGVD).

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The water level in Pond E2C is controlled primarily by discharge gate settings, as intake gates are usually fully open to maximize intake and circulation. Water levels in CP 3C may vary by 0.2-feet and Pond E2C may vary 1-foot over days respectively, and may vary by 0.5-foot more over weeks to months, due to the influence of spring and neap tides and/or weather.

Winter Water Level Control

In the winter, higher water levels are maintained because evaporation is minimal, the highest spring tides are observed, and rainfall and creek outflow may be substantial. Higher water levels reduce intake and circulation and flow through during the winter. Flow is variable based on gate settings and target conditions. Discharge gate settings in Ponds E2 and E2C are the primary factors affecting observed water levels. Routine winter operations vary gate settings less than summer, depending on circulation requirements, target water levels, habitat objectives and salinity. The primary objective of high winter water level is to provide overwintering waterfowl habitat with sufficient recirculation of higher salinity water from seasonal and batch ponds, to reduce overall salinity in the system. A goal of water level and salinity management in the winter is to begin summer operations near ambient SF Bay salinity.

During winter operations, if the water levels exceed approximately 4.20 ft NGVD, Pond E2C intake gate settings may be reduced. Similarly, E2 discharge gate settings may be increased periodically. Excluding rainfall events, one to two weeks of higher volume discharge will drain 0.5 ft from the pond systems. Due to its remote location, the Pond E2 WCS is difficult to access during the winter due to unimproved levees (not graveled).

Ponds E1, E7, E6, E6C, E5, E4 and E2 are managed in winter as open water ponds with low salinity and depths up to 2.5-feet or more. Water surface elevation is maintained by rainfall and continuous circulation with intake from Pond E1 and discharge from E2. All ponds begin transition to deeper water with continuous circulation in October and target depths and salinities are typically attained in December and maintained through March. Ponds E1C, E5C and E4C are managed in winter as open water ponds with low to moderate salinity and are maintained by rainfall and continuous circulation with intake and discharge via E2C. The ponds transition to deeper (1- to 2-feet) water in October with continuous circulation. Target depths and salinities are typically attained in December and maintained through March.

Salinity Control

Maximum discharge salinity is 44 ppt and salinity at Ponds E2 and E2C is generally maintained between 35-44 ppt over the summer. For routine operations, intake gates are fully open with 1-2 discharge gate(s) open at 25% of capacity. The discharge gate settings vary to target optimum habitat, salinity and to maintain adequate water levels. The primary salinity control for the Systems E2/2C is to lower the water level at Ponds E2 and E2C to allow for greater intake and discharge volumes under muted tidal circulation. Increased intake and discharge may help reduce salinity over the course of days to weeks and requires regular adjustment of the discharge gates. Salinity for the systems is not affected by intake pumps (#1 Baumberg Intake, Pond E1; Cal Hill Intake, Pond E1C) because the pumps are not operable due to deterioration and unsafe access.

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Lower water levels may briefly expose portions of the pond bottoms, particularly during neap tide periods, but remain wetted. Drawn down ponds function as mudflats and provide important shorebird foraging and roosting habitat when the outboard mudflats in SF Bay are inundated.

A best management practice (BMP) for salinity control in System E2C includes periodic circulation of pond waters into adjacent seasonal ponds (E5C, E4C and E1C) to improve water quality as a result of greater intake volumes. Operation of shallow open water in ponds E1C, E4C and E5C in summer could result in higher salinity in Pond E2C due to the high surface to volume ratio, minimal circulation and flow because Pond E5C drains into E2C. There is only a combo gate on the E2C side of the culvert.

Ponds E6, E5 and E6C may be operated in the summer season as seasonal (dry) or as “batch” ponds. Salinity typically increases from approximately 30-120 ppt between May and October. Salinity higher than 135 ppt is not desirable because gypsum would precipitate in the ponds. High salinity batch ponds provide conditions that support a different invertebrate community than low salinity circulation ponds. The abundant invertebrate prey may be important for supporting migratory waterbirds. Water levels in batch ponds are controlled by the water level in Pond E1 via Pond E7 and Ponds E2 via E4, since flow from those ponds is used to makeup evaporation losses and maintain desired salinity (80-120ppt).

If salinity control is necessary in batch ponds, recirculation operations may be implemented with flow from low salinity circulation ponds (E1 to E7) to E6/E5. High salinity outflows from Ponds E6/E5 may require further management actions to address increases in salinity in other ponds.

At the end of the evaporation season, typically October, higher salinity water in Ponds E6 and E5 flow into Pond E4 and subsequently mixed/diluted in E2 before discharge. Circulation from Ponds E6 and E5 is sufficiently mixed to maintain discharge salinity below 40 ppt from E2.

The estimated flow rates for salinity control were based on modeling for a dry year with a spring salinity of 30 ppt in the ponds and South San Francisco Bay. If the salinity at the intake is lower than approximately 20 ppt, or the pond salinity in the spring is lower than 30 ppt, discharge flows can be increased to decrease pond salinity during the summer. Similarly, the winter circulation flow may be reduced particularly in wet years with sustained observed low salinity in the ponds, sloughs and SF Bay.

Dissolved Oxygen Control

This pond system will be mainly operated as directional flow open water in the winter and is expected to maintain adequate Dissolved Oxygen (DO) conditions at the beginning of the summer operations period. In the summer, operations maintain the ponds partially dry using muted tidal operations to ensure sufficient mixing for adequate DO discharge conditions. To maintain WQO’s during the summer, inlet and outlet gate settings may be frequently adjusted to maintain lower water levels and ensure sufficient circulation. The objective of shorter residence time of pond water typically ensures low salinity is maintained. In some years, large algal mats form in summer and by fall are decomposing, which creates strong diurnal patterns of DO degradation and recovery. DO levels are expected to be adequate to protect receiving waters during continuous discharge. When using continuous data collection, a “trigger” for continuous circulation discharge reporting was included in

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the Final Order. The trigger value is when the weekly 10th percentile value falls below 3.3 mg/L, when using a continuous monitoring device. When DO levels at the pond discharge fall below the trigger value, Best Management Practices (BMPs) listed in this Operations Plan may be used, including additional monitoring, adjusting intake or discharge settings, or temporarily suspending discharge. Timely notification to RWQCB will be made if substantial, adverse conditions are observed.

BMPs include the reducing or closing the discharge during short periods of time when sustained low DO is observed or expected. Discharge settings are typically adjusted weekly. Daily discharge timing is not practicable due to staff and budget constraints. Reducing or closing the discharge for a period of days during neap tide periods is limited. Limited intake and circulation/mixing appears to prolong residence time of pond water may not improve DO levels. Therefore, maintaining discharge even at reduced volumes allows increased volume of intake and promotes mixing and circulation. This would reduce the duration of time that pond water would be expected to have lower DO conditions. A larger daily volume of water enters the receiving waters, but likely minimizes the duration of low DO potentially affecting receiving waters and may also reduce the period of low DO values in ponds.

Dissolved Oxygen BMPs

As noted above, BMPs have been developed, implemented, and evaluated to reduce potential impacts to receiving waters. These BMPs are discussed below:

1. Slough Monitoring

Additional data may be collected to determine if ambient slough conditions meet water quality objectives and if the receiving waters are potentially affected by low DO pond discharge.

2. Adjust Discharge Flow

Discharge may be decreased to reduce the potential effects in receiving waters. Decreasing discharge may immediately minimize low DO entering receiving waters. However, it may prolong the period in which pond water may be subject to low DO conditions, since intake is more limited with higher water surface elevation during neap tides. Increased discharge volumes promote intake and mixing during strong (spring) tide periods to improve pond water quality.

3. Monthly Discharge Timing

Water control structures have significant discharge capacity. Discharge is typically greater than 25% open to maintain the extent of shallow water and dry pond bottom area. Discharge gates may be set at higher volumes during periods with low tides during the day, when DO is expected to be higher due to algal photosynthesis. When low tides are at night, during those periods gate settings could reduce the volume of discharge when pond DO levels may be lower than ambient.

4. Weekly Discharge Timing

If DO levels are low for a given week, particularly during neap tides, discharge gates are adjusted approximately weekly to reduce discharge when low tides are at night. Increased discharge occurs when higher tides are at night and discharge occurs mostly during the day when pond DO levels are higher. During summer, DO may be higher from approximately 10 a.m. to 10 p.m. Daily discharge

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timing is not practicable due to limited staff availability. Increased discharge settings may briefly increase salinity near the discharge in receiving waters, but is not expected to exceed 44 ppt for extended periods as the volume is very small compared to sloughs.

5. Temporarily Cease Discharge

Temporarily ceasing discharge may prevent low DO conditions locally in receiving waters. However, periods without circulation within ponds could prolong adverse water quality conditions in the pond or could result in poorer conditions, depending on weather and other factors. Stagnating water could also have an adverse effects on the biological resources in the ponds. Long periods of suspended discharge could also create substantial odor as accumulated biomass is exposed and decays, affecting sensitive individuals in the neighboring communities. Discharge may be ceased only for short periods (days), such as when salinity is above 44ppt during neap tide periods. Discharge would resume as soon as possible to adequately mix pond water and improve water quality at the discharge, particularly during spring tide periods.

6. Installation of Baffles

A series of flow diversion baffles installed at the pond discharge to direct the water from more suitable DO waters to achieve maximum oxygen uptake requires frequent maintenance and has been observed to have little affect on pond waters at the discharge. Baffle use is not expected.

7. Mechanically harvest dead algae

Dead algae may be removed by hand when accumulating at the discharge. If extensive mats are noted in the pond, mechanically harvesting dead algae on a pond wide basis is not practicable.

8. Aeration

Aeration would require installation of bubbler/diffuser systems or floating mechanical aerators near the discharge. The effectiveness of aerators was evaluated by U. S. Fish and Wildlife Service in the Alviso ponds in 2005. The aerators were not effective. This BMP is not expected to be implemented.

pH Control

Pond water pH may be related to DO, however past evaluation of continuous data did not show direct correlation. High pH (and low DO) appears due to poor circulation and warm temperatures and other abiotic and biotic factors. Past analysis showed pH values generally ranged 6.5 to 8.5, but in stagnant areas pH approaches 9.0 or greater. Stagnant waters are usually only found far from discharge locations, therefore sampling for ammonia in receiving waters has shown little basis for action in previous analysis. Corrective measures above can be used as needed.

Avian Botulism Control

Avian botulism has not been observed in ELER, and is not expected to occur in typically saline conditions at ELER. To reduce the likelihood of a severe outbreak of this disease, dead bird carcasses observed in the ponds will be promptly collected and buried.

Mobilization of Inorganic compounds and/or the Methylation of Mercury

The operations plan for System E2 and E2C provides constant flooding in circulation ponds. No change in Redox potential is expected, therefore methylation of mercury would be similar to ambient conditions in the bay. Seasonal operations in other ponds would minimize repeated water transfers to reduce the extent to which the ponds would be subject to repeated wetting and drying conditions. Infrequent wet/dry cycles would reduce the potential for methylation of mercury as a result of repeated changes in redox potential. Inorganic compounds and methyl mercury levels were monitored during seasonal ponds operations from 2003-2006 and levels were not found to exceed WQOs, therefore further analysis is not anticipated. Management recommendations relevant to pond operations from the completion of the South Bay Mercury Study in Alviso may be incorporated into future operations plans.

Monitoring and Adaptive Management Action Plan

Pond Management Monitoring

Routine pond management requires weekly or monthly site visits to record pond conditions. The monitoring parameters are listed below. Visual inspections are conducted to locate potentially adverse conditions, as well as inspections of water control structures, siphons, and levees.

Weekly (* = monthly) Monitoring for Pond Management

Pond	Parameter
E1	Pond Water Level, Salinity, Gate Settings, Pump Operations
E7*	Pond Water Level, Salinity, Gate Settings
E4	Pond Water Level, Salinity, Gate Settings
E2	Pond Water Level, Salinity, Gate Settings
E6*	Pond Water Level, Salinity, Gate Settings
E5*	Pond Water Level, Salinity, Gate Settings
E6C*	Pond Water Level, Salinity, Gate Settings
E4C*	Salinity
1C*	Pond Water Level, Salinity
5C*	Pond Water Level, Salinity
E3C	Pond Water Level, Salinity
E2C	Pond Water Level, Salinity, Gate Settings

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Water Quality

The Final Order requires water quality monitoring detailed in the Self-Monitoring Program. The summary below is relevant to summer discharge operations:

Pond Discharge Sampling: Continuous monitoring devices (Datasondes) are not typically used for salinity, pH, temperature, and dissolved oxygen. Grab samples for salinity are regularly collected.

Receiving Water Sampling**:** Slough receiving water quality monitoring is not required. However, we report any adverse conditions observed during summer discharge to RWQCB, and receiving water sampling is completed only when necessary to address outstanding concerns.

Pond Management Sampling: Datasondes to collect pond water quality measurements were discontinued in 2006 due to limited applicability. Grab samples for pond management are collected regularly at the discharge and locations within ponds, as noted in the table above “Weekly/Monthly Monitoring Program for Pond Management”.

Chlorophyll-a sampling: Chlorophyll sampling ceased in 2005 due to limited applicability.

Annual Water Column Sampling for Metals: Water column samples collected from 2003 to 2005. Levels were within WQOs and therefore discontinued due to limited applicability.

Communication of Monitoring Results and Violations

Sufficient information is provided by grab samples and staff gauge observations, among other monitoring parameters, for pond management and operations. CDFW routinely reviews data and contacts RWQCB staff as needed to discuss pond management, operations and monitoring. We provide annual Self-Monitoring Reports that evaluate and discuss pond operations and management. CDFW provides all electronic data collected annually to RWQCB staff.

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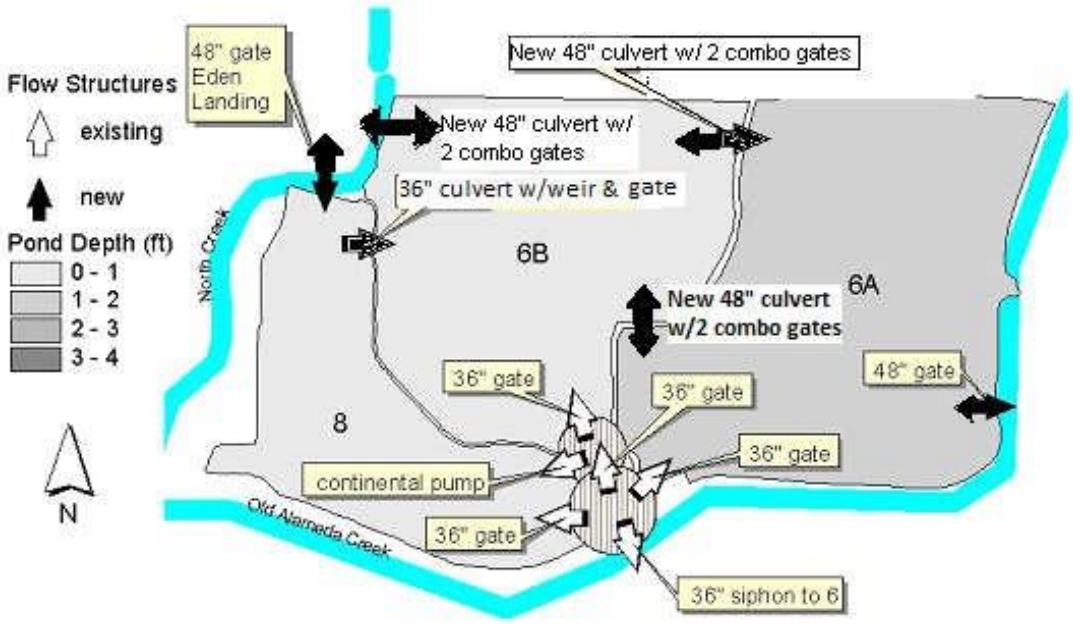
California Department of Fish and Wildlife
Eden Landing Ecological Reserve
Hayward, Alameda County
South Bay Salt Ponds
Operations Plan -- Pond System E6A

Regional Water Quality Control Board
San Francisco Bay Region
Final Order Number: R2-2018-0020
(rescinded R2-2012-0014)



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Summary of Annual Operations Plan Conditions

Typical operations are expected. No substantial changes are proposed in System E6A for 2024.

Pond operations will continue under seasonal and continuous circulation conditions. Higher salinity water within the shallower interior of the ponds circulated into the deeper borrow ditch areas is expected to be sufficiently mixed such that muted-tidal intake/discharge maintains salinity below 44ppt from the May to October monitoring season. This operation is intended to meet goals and objectives for managed ponds as part of the South Bay Salt Ponds Restoration Project (SBSPRP). SBSPRP Phase 1 actions included applied studies to better understand pond dynamics and inform pond management as part of planning and implementation of future SBSPRP restoration and enhancement actions. Pond operations may be adaptively managed based on on-going monitoring and studies to support habitat and water quality objectives.

Conditions observed in the spring and summer months reflect lower than average rainfall totals in March. Higher than typical salinity values were observed in managed ponds throughout 2022, likely due to drought conditions. Typical salinity values were observed in 2023. Moderate salinity values are maintained in summer with normal operations and sustained high discharge settings, keeping salinity generally below 44ppt. In-pond salinity averages since the 2012-2016 drought have been normal and we maintain continuous circulation during summer with low water levels.

Introduction

This Operations Plan describes the Pond System E6A management activities to meet the goals and objectives for managed ponds at Eden Landing Ecological Reserve (ELER), owned and operated by California Department of Fish and Wildlife (CDFW). Pond operations are described in the South Bay Salt Ponds Initial Stewardship Plan, Phase One SBSPRP actions and the requirements of the Regional Water Quality Control Board's (RWQCB) Final Order. A detailed description of System E6A operations is discussed in the System Description section, Summer & Winter management activities are discussed in the Management section, and the specific corrective measures proposed as part of adaptive management of the system are described in the Operations, Constraints, and Corrective Measures section. Existing water control structures (WCS) primarily include 48" culverts with combination slide/flap tide gates that allow the ponds to be operated independently under muted tidal conditions, or be operated in series with more directional, continuous circulation. A small box-weir may be operated as needed in Pond E6B near the North Creek intake/discharge structure to manage water levels between the borrow ditch and the higher playa areas of the pond.

Prior to 2012, System E6A was operated by CDFW as a seasonal pond complex, with little intake and no discharge; pond water was allowed to draw down and mostly dry during the summer. Since 2012, System E6A has been operated with continuous circulation throughout a portion of the ponds during the summer under modified, seasonal conditions. New culverts were installed and levee improvements were made between Ponds E6A and E6B in 2014-16. Ponds are drawn down to provide sufficient, dry pond bottom areas while maintaining open water in borrow ditches, relict channels and deeper pond bottom areas by continuous circulation. The objective of pond operations is to provide diving duck pond habitat in winter and shorebird foraging/roosting pond habitat in summer, with sufficient dry pond bottom maintained as nesting habitat for resident and other breeding shorebirds. System E6A ponds provide the greatest contiguous extent of seasonal pond area within

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ELER to support western snowy plover (WSP) nesting. Summer operations maintain adequate water quality for continuous circulation and discharge, while maintaining adequate dry, playa habitat specifically for nesting WSP and other species. Pond management is intended to ensure persistence of invertebrate prey year-round, particularly for estuarine prey species utilized by diving ducks. Habitat objectives for diving ducks are included in pond management as part of mitigation efforts for the Cosco Busan oil spill. Routine monitoring is conducted as part of active management. System E6A operates as expected for continuous circulation conditions, maintaining low water surface elevation and discharge salinity generally below 44ppt.

Eden Landing Ecological Reserve (Baumberg Complex) Location

ELER, formerly called the Baumberg Complex and also referred to as Eden Landing, consists of a 6,400-acre complex of solar evaporator ponds along the eastern shores of San Francisco Bay in Hayward, Alameda County, and is owned and operated by CDFW. Prior to the 2003 acquisition from Cargill, all ponds within this complex were under Cargill ownership as part of their solar salt production pond system. The approach to the San Mateo Bridge (Highway 92) and the original 835-acre ELER, formerly known as the “Baumberg Tract,” forms the northern boundary of the complex. The site is bordered on the east by Old Alameda Creek, residential and commercial areas in the Cities of Hayward and Union City. Alameda Creek Flood Control Channel (aka Coyote Hills Slough) and other Alameda County property and the Coyote Hills Regional Park are near the southern boundary. San Francisco Bay borders the site to the west.

The main channels within ELER include Mount Eden Creek, North Creek and Old Alameda Creek. Alameda Creek Flood Control Channel is located on the southern perimeter of ELER. North Creek was restored to tidal action at Old Alameda Creek in April, 2005 and breached into the Eden Landing Ecological Reserve (Baumberg Tract) restoration site 1 miles upstream in October 2006. Mt. Eden Creek was restored to tidal action at the Bay in November 2006 and breached into the Eden Landing Ecological Reserve (Baumberg Tract) restoration site 2 miles upstream in October 2008. Several hundred acres of extant tidal marsh front the San Francisco Bay, known as the Whale’s Tail Marsh, are at the Bayfront near the center of the complex. This marsh is located outboard of former Ponds E9 and E8A, between Mount Eden Creek and Old Alameda Creek and along the western perimeter of Pond E1 and a portion of Pond E2.

Pond System E6A

These ponds are most easily accessed from the Veasy Street gate in Union City. System E6A was operated under the Initial Stewardship Plan (ISP) beginning in 2005. Ponds E8 (primary intake), E6B (flow through) and E6A (inlet/outlet) and their acreages and average bottom elevations are shown in Table 1. Management and pond operations occur by gravity flow, with WCS’s in each pond along a slough, such that each pond can be operated independently to target management for different objectives in each pond or may be operated in series configurations, depending on water levels and other management objectives. Previously existing water control infrastructure includes two control ponds (“donuts” each less than 1 acre) located between the three ponds and a pump (Continental Pump) near Old Alameda Creek. The donuts are shown in the system map, to indicate existing structures and typical direction of flow. The south donut is connected by gated culverts to Ponds E8 and E6A, to the north donut and to the siphon to Pond E6 on the south side of the Old Alameda Creek channel. The north donut is connected to Pond E6B and the south donut. The north donut is

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the source for water for the Continental pump. For salt production, the control ponds and pump were used to transfer water to Pond E6 to continue water movement through the concentrator ponds. For current operations, the pump is not used regularly, and water is not transferred from System E6A to System E2.

Salinities within ponds typically range from low to medium levels (25-40 to 40-80 ppt) with discharge salinities generally below 44 ppt. Typical discharge salinities range from 20-40 ppt, with brief periods of elevated salinity (approximately 44 ppt), particularly during neap tides.

The pond management of this system is characterized as modified, continuous circulation that provides foraging, roosting and nesting habitat in open water, shallow water or dry pond bottom areas for a variety of migratory and resident waterbirds. Ponds are adaptively managed based on on-going operations and the results of monitoring. Winter operations support foraging and roosting habitat for diving ducks as part of mitigation efforts associated with the Cosco Busan oil spill. In the summer, continuous circulation operations maintain dry bottom as nesting habitat and shallow water foraging habitat (generally less than six inches) for resident species such as black-necked stilts, American avocet, and the federally threatened western snowy plover (WSP).

Management under modified seasonal pond operations during the summer provides a large area of dry pond bottoms, while maintaining sufficient, low salinity water in each pond (primarily in deeper borrow ditches) to support benthic invertebrates and maintain water quality and habitat management objectives. Managed pond operations are considered muted tidal, with higher intake and discharge volumes and continuous circulation sufficient to maintain target water levels and low salinity conditions. The ponds may be operated in series with flow-through circulation or be operated independently, to provide habitat types characterized by different salinity ranges and water levels.

Table 1. Pond Size and Bottom Elevations

Pond	Area (acres)	Bottom Elevation (ft NGVD)
E8	180	3.7
E6B	284	2.1
E6A	340	0.9
Total/Average	804	2.0

Biological Resources

Many waterbird species are known to use System E6A. System E6A ponds are heavily used by shorebirds for foraging during spring and fall migratory seasons. Shorebirds and other waterbirds may also use these ponds for roosting which may occur on levees, exposed or shallow berms and on remnants of wooden structures. Pond operations target optimum shallow pond water conditions for foraging and roosting shorebirds, maintained by increased discharge and/or limited intake during the spring and fall.

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Ponds in System E6A system are flooded in the winter, providing waterfowl with suitable open water foraging habitat in deeper pond areas, while shorebirds and wading birds use shallower pond areas for foraging and roosting. Summer operations include limited ponding with maintenance of sufficient dry pond bottom panne/playa habitat, using muted tidal intake and discharge in each pond. Summer operations target shallow water with deeper water circulated in borrow ditches in Ponds E6A and E6B. Pond E8 is mostly dry in the summer in the northern portion of the ponds, due to the high pond bottom elevation at the intake, to maintain nesting habitat for western snowy plover (WSP) and wading birds. The ponds are managed to have low salinity in the winter and spring to maintain continuous circulation salinity levels in summer. The ponds are reflooded in the fall with the onset of cooler weather via rainfall and increased gravity inflow. Operations include muted tidal intake/discharge gate settings. Ponds E8, E6B and E6A provide suitable water levels for waterbirds during the fall migration season. Water quality objectives (WQOs) are generally met for summer operations.

System E6A ponds are characterized by modified, continuous circulation pond management in summer, with salinities ranging from low (20-40 ppt) to medium (40-80 ppt) levels, using muted tidal intake/discharge operations in Ponds E6B and E6A and limited intake/discharge operations in Pond E8. Summer operations include transition periods in the spring and fall that provide foraging and roosting habitat for migratory shorebirds and provide nesting and foraging habitat for WSP. Sufficient water is maintained for continuous circulation within ponds to produce brine flies and other invertebrates for suitable shorebird foraging habitat.

System E6A ponds are flooded and maintained deeper in winter to support overwintering waterfowl. Winter operations provide 1- to 3-foot open water depths in System E6A ponds for waterfowl including bufflehead, scaup, ruddy duck and Northern shoveler, among other species. In winter, some shallow areas are maintained for shorebird roosting and foraging along pond margins, internal berms and higher pond bottom areas. High concentrations of small to medium shorebirds are typically observed in ponds north of Old Alameda Creek in System E6A and System E12. Small to medium shorebirds are known to forage and roost in shallow water areas within managed ponds.

System E6A may support fish populations in system ponds in the fall, winter and early spring and may be supported in the borrow ditches in summer. No restrictions on intake are expected since salmonid entrainment is not anticipated to be an issue, as Old Alameda Creek is not suitable spawning habitat due to the barrier to passage that is found at the 20 Tide Gate crossing structure approximately 3 miles upstream from the mouth and lack of suitable spawning habitat upstream. North Creek is similarly not suitable for salmonid spawning. For a more complete discussion of these species and potential occurrence, see the Final EIR/EIS for the South Bay Salt Ponds Initial Stewardship Plan (April 2004).

E6A System Description

Objectives

The objective of pond management and operations is to provide suitable foraging, roosting and nesting habitat for different waterbird species during different seasons, while maintaining water quality objectives and benthic invertebrate production. One of the objectives of managing ponds with low salinity discharge in the summer is to support the prey base for overwintering waterfowl, particularly

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diving ducks, while maintaining suitable habitat for migratory and nesting shorebirds. The ponds have varying pond bottom elevations and topography, reflecting historic salt marsh, salt production and other previous land uses. Pond management is modified, continuous circulation, compared to more typical seasonal ponds, which are mostly dry in summer and flooded in the winter by rain. Muted tidal, year round operations promote more complete, shallow flooding in fall and spring, substantial dry pond bottom (aka playa/panne) habitat in summer and deeper ponded conditions in winter.

System E6A is operated to provide appropriate water levels and salinity ranges to support shorebird foraging, roosting and nesting in spring, summer and fall, and to support waterfowl, particularly diving ducks, during the winter. The primary objective in System E6A in summer is to provide foraging habitat for shorebirds, specifically to provide salt panne habitat suitable for WSP nesting, while meeting water quality objectives under modified, continuous circulation operations. Summer operations are expected to include continuous circulation provided by muted tidal intake and discharge to maintain discharge salinity below 44ppt, while maintaining higher salinity shallow water areas within the ponds. In winter, the primary objective is to maintain suitable habitat with low salinity for waterfowl, particularly diving ducks.

Operation of the ponds maintains flow in series from Pond E8, augmented by intake/discharge in Ponds E6B and E6A. Flow direction would be determined based on observed/predicted tides, weather conditions and habitat conditions in the ponds, such that each pond may support shorebirds and waterfowl according to seasonal use patterns. A summary of operational objectives is below.

- Operate Ponds E8, E6B and E6A as modified, continuous circulation ponds
- Manage for different water surface elevations in summer vs. winter
- Draw down ponds in spring and maintain low water surface elevations during the summer to promote WSP nesting with adequate shorebird foraging and roosting habitat.
- Maintain deeper open water during the winter for waterfowl
- Maintain discharge salinity at levels below 44 parts per thousand (ppt).

Water Control Structures (WCS's)

System E6A ponds may be operated independently or in series using the following WCS's:

- One 48" culvert from North Creek to Pond E8 with combination gates on both sides (E6A-1)
- Existing pond-to-pond connections between:

  Pond E6A and E6B, via one 36" pipe with two combination gates

  Pond E8 to E6B, via one 36" culvert with a combination gate and a weir

  Pond E8 and E6B, via north "donut" control pond (36" slide gate)

  Pond E6B and E6A, via two 48" WCS with combination gates (E6A-3)

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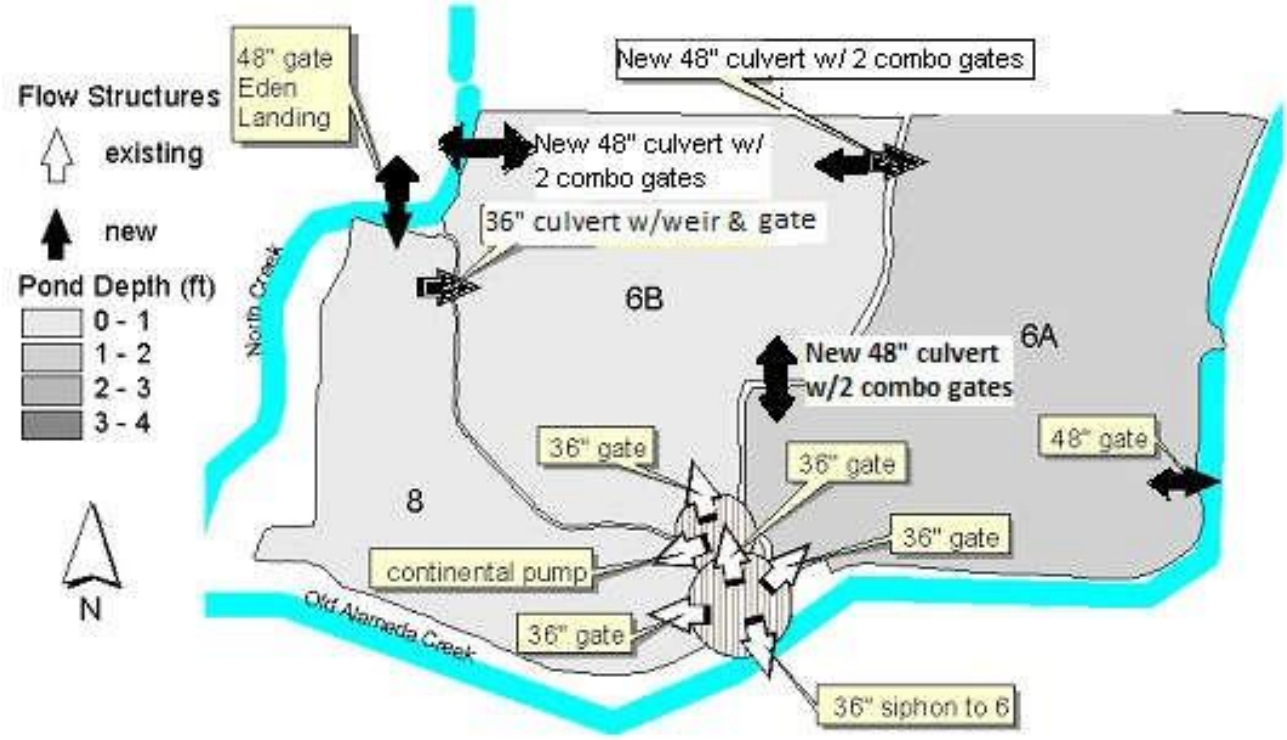
Pond E8 and E6A, via south “donut” control pond (36” slide gate)

- One 48” culvert with two combination gates at Pond E6A and Old Alameda Creek for intake/discharge (E6A-10)
- One 48” culvert with combination gates at Pond E6B and North Creek for intake/discharge (E6A-2)
- Continental Pump (Not Operable)
- Siphon culvert under Old Alameda Creek from south donut to pond E6

Figure 1. Map of Ponds and Water Control Structures



Note: Pond depths will vary based on pond management objectives, season, and conditions.

Management Operations

Modified seasonal pond operations with continuous circulation during the winter and summer seasons requires regular adjustment of water control structures and monitoring of salinity and water levels. System 6A ponds are operated with deep, open water during the winter to support over-wintering waterfowl, particularly diving ducks. During the summer, the ponds are partially dry, with flow sufficient to maintain continuous circulation to support breeding, foraging and roosting habitat for

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migratory and resident shorebirds, including WSP. Spring and fall operations transition salinity and water levels that target shallow water conditions for migratory shorebirds.

System E6A operations allow continuous circulation within ponds during the summer when high evaporation rates occur. Directional flow varies and muted tidal intake/discharge operations occur throughout the year. In the winter, deeper water is maintained, followed by draw down to shallow water in the spring for migratory shorebird use. Water levels are maintained low in the summer, with continuous circulation primarily within deeper borrow ditches and connected interior channels, allowing large areas of dry pond bottom to be used for nesting shorebirds. The ponds are shallowly inundated during the fall, then operated deeper during the winter. Shallow water conditions in spring through fall result from high evaporative loss and higher volume discharge operations during the summer. Intake from North Creek to Pond E8 and flow to subsequent ponds is limited because of the high pond bottom near the water control structure. Flow to Pond E6B from Pond E6A or Pond E8 occurs in the summer to ensure adequate circulation of higher salinity water from areas in the ponds more remote from intake locations. Intake to Pond E6B typically occurs directly from North Creek, augmented by flow from Pond E8 via the north control pond (donut). Similarly, intake to Pond E6A typically occurs directly from Old Alameda Creek, augmented by flow from Pond E8 via the south control pond (donut).

The intake/discharge WCS's and internal connections allow independent continuous circulation, or, ponds may be operated in series with flow through, augmented by muted tidal intake and discharge via North Creek or Old Alameda Creek. Each pond has one 48" intake/discharge culvert. A single 36" culvert and two 48" culverts connect Ponds E6A and E6B to allow flow near the middle and northern reaches of the E6A-E6B cross levee. In addition, two 24" culverts are operable between each pond in each of the two control ponds ("donuts" each <1-ac) located between the three ponds. The south donut is connected to Ponds E8 and E6A and the old siphon to Pond E6. The north donut is connected to Pond E6B and E8. The north donut also provides the source of water for the Continental Pump, but the pump is no longer operable.

System 6A ponds have low salinity conditions in the winter and spring and somewhat higher salinity in the summer and fall. Pond operations are expected to maintain salinity below 44 ppt at the discharge locations using muted tidal intake and discharge and continuous circulation. More remote locations within the pond farthest from intake/discharge locations that are shallowly flooded have higher salinity. In summer, pond salinity is typically moderate and varies according to warm weather and spring-neap tide patterns, decreased gravity inflow and high evaporative loss. The overall pond salinity is typically low and consistent in the winter due to increased gravity inflow, rainfall, and low evaporative loss. WQO's are adequately met by muted tidal operations maintained in each pond, supplementing flow from adjacent ponds.

As modified seasonal, continuous circulation ponds, System E6A ponds provide suitable foraging habitat for shorebirds, particularly in the spring and summer, and provides salt panne habitat suitable for nesting by WSP and other shorebirds. Shallowly inundated areas are maintained in limited areas in winter for foraging shorebirds, including WSP. Pond operations maintain lower salinity open water in deeper borrow ditch areas that are subject to continuous circulation, intended to maintain suitable conditions for benthic invertebrates that provide the prey base for overwintering waterfowl.

Table 1. System E6A Inflow and Outflow

Period	Gravity Intake Flow		Discharge Flow	
	Average	**Peak**	**Average**	**Peak**
Winter November – May	10 cfs 4500 gpm	100 cfs 45,000 gpm	5 cfs 2,250 gpm	50 cfs 22,500 gpm

Table 2. System E6A Average Water Surface Elevations

Pond	Area (acres)	Average Bottom Elevation (ft NGVD)	Water Elevation (ft NGVD, NAVD*)		
			(Cargill ops, as reference)	**Summer**	**Winter**
E8	180	3.7	6.5	3.6, ~5.5*	3.8, ~6.5*
E6B	284	2.1	3.0	2.1	3.3
E6A	340	0.9	3.1	2.1	3.1
Total/ Average	804	2.0	4.2	2.6	3.4

Inflow, outflow and water surface elevations vary depending on season, operational objectives, pond and slough depth (head) and weather conditions.

Modified Continuous Circulation Operations

System E6A requires year-round, active management of ponds to ensure water quality and habitat management objectives are met. Pond water surface elevations are controlled primarily by adjusting the WCS gates at the intake to and/or discharge from ponds. Intake salinities are affected by seasonal salinity of the bay and sloughs. Pond operations maintain low salinity discharges similar to ambient bay salinities.

WSP and other shorebirds use this system for nesting on dry pond bottoms (playa habitat) in summer. System E6A has continuous circulation ponds in the fall, with muted tidal operations to provide suitable depth for foraging habitat for migratory shorebirds. In the winter, the ponds are flooded by reducing discharge during continuous circulation, augmented by rainfall, using muted tidal intake/discharge operations to maintain deep open water for overwintering waterfowl, particularly diving ducks. Pond areas such as berms will maintain sufficiently shallow water for overwintering flocks of small to medium shorebirds.

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Winter

For winter operations, the Pond E6B to Pond E6A culverts are set to optimize the water surface elevations within the ponds and periodically adjusted to promote directional flow. Water is circulated from Pond E8 to E6B and E6A, supplemented by muted tidal intake and discharge via the Pond E6A and Pond E6B WCS's. Pond E8 is generally operated at a higher elevation because of the higher pond bottom. The water level in Pond E8 is mainly controlled by gate settings at the E8-North Creek intake/discharge. The Pond E8 control pond (donut) gates are usually open to allow flow to pond E6B, to pond E6A, depending on water levels. Ponds require less active management to maintain flows in the fall and winter. Gate settings are in Table 3.

Table 3. Gate Settings

Gate	Winter Settings (% open)	Summer Settings (% open)
Pond E8 Intake/Discharge (E6A-1)	100/25 **	100/25 **
Pond E6B Intake/Discharge (E6A-2)	100/25 Varies **	25/100 Varies **
Pond E6A Intake/Discharge (E6A-10)	100/25 Varies **	25/100 Varies **

Gate settings control how much water can enter based on tide elevations.
** Depending on target water level, pond objectives and management

Summer

Ponds in System E6A have low water levels during the summer, circulating mainly in borrow ditches and deeper areas within ponds E6B and E6A. Pond E8 water level is maintained by intake/discharge gate settings at North Creek, with periodic circulation into ponds E6B and E6A. Ponds E6B and E6A are operated with muted tidal intake and discharge. In the spring, the system is drawn down for migratory shorebirds then for summer operations by reduced intake and/or increased discharge. This typically begins in March, depending on target habitat conditions in the ponds. The transition could be delayed or advanced based on use of the pond by migratory birds, WSP nesting activities, or desired salinity levels in the ponds. Active management is required to maintain target water levels and salinities in these modified continuous circulation ponds, particularly through the summer and fall due to nesting use and spring-neap tide cycles.

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Constraints and Corrective Measures

Constraints

The primary constraint in operating this system is the ability to adequately circulate water in the ponds in the summer to maintain low salinity discharges which meet WQOs. Circulation is necessary to maintain suitable foraging, roosting and nesting habitat for shorebirds and to support benthic invertebrate populations through the summer. Summer operations use tidal intake/discharge gate settings to maintain shallow ponds with regular management to ensure sufficient mixing with continuous circulation below 44 ppt.

Muted tidal pond operations have limited intake and greater discharge volumes to help ensure lower water surface elevations and lower pond salinities. During the summer evaporation season, the ponds must operate at low water level to protect western snowy plover and other nests on dry pond areas while maintaining continuous discharge salinities below 44 ppt.

Corrective Measures

Records are maintained on pond water levels, salinity grab samples and bird use. Tide levels and gate settings are noted and evaluated to determine optimum operations. The records are used to evaluate the effects of pond management activities on discharge and habitat objectives.

Water Level Control

Pond water level is controlled mainly by discharge gate settings in Ponds E8, E6B and E6A under continuous circulation (directional flow) in System E6A. Low water levels in summer in Ponds E8 and E6B expose pond bottoms, with less bottom exposed in Pond E6A. Gate settings maintain lower water levels with adequate mixing to ensure discharge below 44 ppt.

Because water levels in the ponds are above mean water level in the sloughs, the pond discharges for more hours of the day than the duration of intake. The water level in the ponds may vary by 0.5’ over the course of weeks due to the influence of neap (weak) and spring (strong) tides and weather conditions.

Salinity Control

The maximum salinity for discharge operations is 44 ppt as described in the Final Order. For routine operations, pond-to-pond circulation and muted tidal intake and discharge are increased when the salinity is near 40 ppt, to decrease the water levels in System E6A and increase the inflow at high tide. The increased circulation flow and lower water surface elevation reduces overall salinity by promoting mixing and lower residence time. Lower water levels in System E6A make the water levels more sensitive to monthly cycles of neap-spring tide cycles. Intake and discharge gate settings are adjusted to reduce inflow during periods of spring tides to minimize fluctuating water levels and minimize rewetting dry pond bottom areas. Gates are also adjusted as needed during neap tides as needed to maintain sufficient water in the ponds.

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Dissolved Oxygen Control

This pond system will be mainly operated as directional flow open water in the winter and is expected to maintain adequate Dissolved Oxygen (DO) conditions at the beginning of the summer operations period. In the summer, operations maintain the ponds partially dry using muted tidal operations to ensure sufficient mixing for adequate DO discharge conditions. To maintain WQO's during the summer, inlet and outlet gate settings may be frequently adjusted to maintain lower water levels and ensure sufficient circulation. The objective of shorter residence time of pond water typically ensures low salinity is maintained. In some years, large algal mats form in summer and by fall are decomposing, which creates strong diurnal patterns of DO degradation and recovery. DO levels are expected to be adequate to protect receiving waters during continuous discharge. When using continuous data collection, a "trigger" for continuous circulation discharge reporting was included in the Final Order. The trigger value is when the weekly 10^{th} percentile value falls below 3.3 mg/L, when using a continuous monitoring device. When DO levels at the pond discharge fall below the trigger value, Best Management Practices (BMPs) listed in this Operations Plan may be used, including additional monitoring, adjusting intake or discharge settings, or temporarily suspending discharge. Timely notification to RWQCB will be made if substantial, adverse conditions are observed.

BMPs include the reducing or closing the discharge during short periods of time when sustained low DO is observed or expected. Discharge settings are typically adjusted weekly. Daily discharge timing is not practicable due to staff and budget constraints. Reducing or closing the discharge for a period of days during neap tide periods is limited. Limited intake and circulation/mixing appears to prolong residence time of pond water may not improve DO levels. Therefore maintaining discharge even at reduced volumes allows increased volume of intake and promotes mixing and circulation. This would reduce the duration of time that pond water would be expected to have lower DO conditions. A larger daily volume of water enters the receiving waters, but likely minimizes the duration of low DO potentially affecting receiving waters and may also reduce the period of low DO values in ponds.

Dissolved Oxygen BMPs

As noted above, BMPs have been developed, implemented, and evaluated to reduce potential impacts to receiving waters. These BMPs are discussed below:

1. Slough Monitoring

Additional data may be collected to determine if ambient slough conditions meet water quality objectives and if the receiving waters are potentially affected by low DO pond discharge.

2. Adjust Discharge Flow

Discharge may be decreased to reduce the potential effects in receiving waters. Decreasing discharge may immediately minimize low DO entering receiving waters. However, it may prolong the period in which pond water may be subject to low DO conditions since intake is more limited with higher water surface elevation during neap tides. Increased discharge volumes promote intake and mixing during strong (spring) tide periods to improve pond water quality.

3. Monthly Discharge Timing

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Water control structures have significant discharge capacity. Discharge is typically greater than 25% open to maintain the extent of shallow water and dry pond bottom area. Discharge gates may be set at higher volumes during periods with low tides during the day, when DO is expected to be higher due to algal photosynthesis. When low tides are at night, during those periods gate settings could reduce the volume of discharge when pond DO levels may be lower than ambient.

4. Weekly Discharge Timing

If DO levels are low for a given week, particularly during neap tides, discharge gates are adjusted approximately weekly to reduce discharge when low tides are at night. Increased discharge occurs when higher tides are at night and discharge occurs mostly during the day when pond DO levels are higher. During summer, DO may be higher from approximately 10 a.m. to 10 p.m. Daily discharge timing is not practicable due to limited staff availability. Increased discharge settings may briefly increase salinity near the discharge in receiving waters, but is not expected to exceed 44 ppt for extended periods as the volume is very small compared to sloughs.

5. Temporarily Cease Discharge

Temporarily ceasing discharge may prevent low DO conditions locally in receiving waters. However, periods without circulation within ponds could prolong adverse water quality conditions in the pond or could result in poorer conditions, depending on weather and other factors. Stagnating water could also have an adverse effects on the biological resources in the ponds. Long periods of suspended discharge could also create substantial odor as accumulated biomass is exposed and decays, affecting sensitive individuals in the neighboring communities. Discharge may be ceased only for short periods (days), such as when salinity is above 44ppt during neap tide periods. Discharge would resume as soon as possible to adequately mix pond water and improve water quality at the discharge, particularly during spring tide periods.

6. Pump Circulation Ponds to Seasonal/Batch Ponds

Infrastructure remains from Cargill operations. Pond water could be transferred by pump from Pond E6B into System E2 via the Continental Pump and donut ponds into Pond E6 via the siphon under Old Alameda Creek. However, this pump is no longer operable.

7. Installation of Baffles

A series of flow diversion baffles installed at the pond discharge to direct the water from more suitable DO waters to achieve maximum oxygen uptake requires frequent maintenance and has been observed to have little affect on pond waters at the discharge. Baffle use is not expected.

8. Mechanically harvest dead algae

Dead algae may be removed by hand when accumulating at the discharge. If extensive mats are noted in the pond, mechanically harvesting dead algae on a pond wide basis is not practicable.

9. Aeration

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Aeration would require installation of bubbler/diffuser systems or floating mechanical aerators near the discharge. The effectiveness of aerators was evaluated by U. S. Fish and Wildlife Service in the Alviso ponds in 2005. The aerators were not effective. This BMP is not expected to be implemented.

pH Control

Pond water pH may be related to DO, however past evaluation of continuous data did not show direct correlation. High pH (and low DO) appears due to poor circulation and warm temperatures and other abiotic and biotic factors. Past analysis showed pH values generally ranged 6.5 to 8.5, but in stagnant areas pH approaches 9.0 or greater. Stagnant waters are usually only found far from discharge locations, therefore sampling for ammonia in receiving waters has shown little basis for action in previous analysis. Corrective measures above can be used as needed.

Avian Botulism Control

While avian botulism has not been observed in ELER, and is not expected to occur in typically saline conditions. To reduce the likelihood of a severe outbreak of this disease, any dead bird carcasses in the ponds will be promptly collected and buried.

Mobilization of Inorganic compounds and/or the Methylation of Mercury

Modified seasonal pond operations using muted tidal intake and discharge are not expected to result in wetting and drying conditions that result in a change in Redox potential. Inorganic compounds and methyl mercury levels were monitored during seasonal ponds operations from 2003-2006 and levels were not found to exceed WQOs, therefore further analysis is not anticipated. Management recommendations relevant to pond operations from the completion of the South Bay Mercury Study in Alviso may be incorporated into future operations plans.

Monitoring and Adaptive Management Actions

Monitoring Activities

Pond Management

Routine pond management requires weekly or monthly site visits to record pond conditions. The monitoring parameters are listed below.

Weekly/Monthly Monitoring Program for Pond Management

Location	Parameter
Pond E8 intake/discharge	Pond Water Level, Salinity, Gate Settings
Pond E6B intake/discharge	Pond Water Level, Salinity, Gate Settings
Pond E6A intake/discharge	Pond Water Level, Salinity, Gate Settings
Pond E6A-E6B culverts	Pond Water Level, Salinity, Gate Settings

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Weekly observations include observations to note levee erosion, vandalism, potential algae buildup and potential avian disease outbreaks such as botulism and cholera.

Water Quality

The Final Order requires water quality monitoring detailed in the Self-Monitoring Program. The summary below is relevant to summer discharge operations:

Pond Discharge Sampling: Continuous monitoring devices are not typically used for salinity, pH, temperature, and dissolved oxygen. Grab samples for salinity are regularly collected.

Receiving Water Sampling**:** Slough receiving water quality monitoring is not required. However, we report any adverse conditions observed during summer discharge to RWQCB, and receiving water sampling is completed only when necessary to address outstanding concerns.

Pond Management Sampling: Datasondes to collect pond water quality measurements were discontinued in 2006 due to limited applicability. Grab samples for pond management are collected regularly at the discharge and locations within ponds, as noted in the table above “Weekly/Monthly Monitoring Program for Pond Management”.

Chlorophyll-a sampling: Chlorophyll sampling ceased in 2005 due to limited applicability.

Annual Water Column Sampling for Metals: Water column samples collected from 2003 to 2005. Levels were within WQOs and therefore discontinued due to limited applicability.

Communication of Monitoring Results

Sufficient information is provided by grab samples and staff gauge observations, among other monitoring parameters, for pond management and operations. CDFW routinely reviews data and contacts RWQCB staff as needed to discuss pond management, operations and monitoring. We provide annual Self-Monitoring Reports that evaluate and discuss pond operations and management. CDFW provides all electronic data collected annually to RWQCB staff.

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